

KEY ISSUES ON LAND USE, LAND USE CHANGE AND FORESTRY (LULUCF) WITH AN EMPHASIS ON DEVELOPING COUNTRY PERSPECTIVES

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Capacity development for policy makers: addressing climate change in key sectors

The UNDP “Capacity development for policy makers” project seeks to strengthen the national capacity of developing countries to develop policy options for addressing climate change across different sectors and economic activities, which could serve as inputs to negotiating positions under the United Nations Framework Convention on Climate Change (UNFCCC). The project will run in parallel with the “Bali Action Plan” process – the UNFCCC negotiations on long-term cooperative action on climate change set to conclude in December 2009 in Copenhagen at the fifteenth Conference of the Parties.

This paper is one of a series produced for the project that provides in-depth information on the four thematic building blocks of the Bali Action Plan – mitigation, adaptation, technology and finance – as well as on land-use, land-use change and forestry. The project materials also include executive summaries for policymakers, background briefing documents and workshop presentations. These materials will be used for national awareness-raising workshops in the participating countries.

Disclaimer

The views expressed in this publication are those of the author(s) and do not necessarily represent those of the United Nations, including UNDP, or their Member States.

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CONTENTS

Acronyms	3
Units and Measures	5
1. Introduction	8
2. LULUCF activities under the Convention and its Kyoto Protocol	8
2.1 Milestones in the process	9
2.1.1 Initial discussions	9
2.1.2 Adoption of the Kyoto Protocol (1997)	9
2.1.3 Conference of the Parties (COP) 7 (2001)	10
2.2 LULUCF activities in Annex I Parties	11
2.2.1 Accounting rules	11
2.2.2 Reporting requirements	11
2.3 LULUCF activities in non-Annex I Parties	13
2.4 Lessons learned from LULUCF negotiations	14
3. Technical and methodological issues and requirements for future LULUCF options	15
3.1 Carbon pools	15
3.2 Baseline or reference scenario	16
3.3 Leakage	18
3.4 Permanence	19
3.5 Additionality	19
3.6 Environmental and socioeconomic impacts of mitigation activities	20
3.7 Monitoring and reporting	20
4. Mitigation options in forestry with a focus on developing countries	20
4.1 Reducing emissions from deforestation and forest degradation	23
4.2 Forest management	26
4.3 Forest restoration	27
4.4 Afforestation and Reforestation	28
4.5 Substitution and the use of forest biofuel	29
5. Overview of existing policy options	31
5.1 Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP)	31
5.2 Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA)	31
5.3 Ongoing discussion in the SBSTA with regard to REDD	32
5.4 Policy Instruments and Approaches	33
5.5 Financing Options	34
Source: Submissions by Parties	37
Conclusions	38
Further reading	40
References	40

Annexes	44
Annex 1. Key definitions in LULUCF	44
Annex 2. Definitions of deforestation and forest degradation	46
Annex 3. Input from the IPCC on LULUCF matters	48
Annex 4. Decision pathway for A/R CDM and REDD	50
Annex 5. From LULUCF to Agriculture, Forestry and Other Land Use (AFOLU)	51
Annex 6. Glossary	52
Tables	
Table 1: A comparison regarding LULUCF emissions and removals	11
Table 2: Mitigation options in forestry	21
Table 3: Estimates of carbon loss from forests attributed to deforestation	24
Table 4: Deforestation and forest degradation (DD) according to direct drivers in the 90s	25
Table 5: Estimated extent of degraded forest landscapes by category in Tropical Asia, Tropical America and Tropical Africa (million ha) in year 2000*	28
Table 6: Issues under current discussion	32
Table 7: Main positive and negative aspects of different policy instruments	33
Table 8: Some proposals for funding mechanisms on REDD	35
Figures	
Figure 1: Carbon pools in forests	16
Figure 2: Illustrative overview of mitigation options in forest management	22
Boxes	
Box 1: Key definitions of the UNFCCC relevant to LULUCF	10
Box 2: Handling of forests in an Annex I Party: Switzerland	12

Acronyms

AFOLU	Agriculture, Forestry and Other Land Use	DD	Deforestation and forest degradation
Annex I	Annex to the Convention listing industrialised and transitional countries	ENCOFOR	Environment and Community-based Framework for Designing Afforestation, Reforestation and Revegetation Projects in the CDM
Annex II	«Annex to the UNFCCC, listing mostly OECD countries, with additional commitments to assist developing countries with funding and technology transfer	EU ETS	European Union Emission Trading System
AR4	IPCC Fourth Assessment Report	FAO	Food and Agriculture Organization
A/R	Afforestation and reforestation	FCPF	Forest Carbon Partnership Facility
ARWG	Afforestation/Reforestation Working Group	GEF	Global Environment Facility
ARD	Afforestation, reforestation, deforestation (as a requirement for Annex I countries in the KP)	GFP	Global Forest Partnership
AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol	GHG	Greenhouse gas
AWG-LCA	Ad Hoc Working Group on Long-term Cooperative Action under the Convention	GPG	Good Practice Guidance
BAP	Bali Action Plan	Ha	Hectare
CDM	Clean Development Mechanism	HFC	Hydrofluorocarbons
CDM A/R	Afforestation and Reforestation project activities under the CDM	HWP	Harvested wood products
CER	Certified emission reductions	IFRT	International Forest Retention Fund
tCER	temporary CER	IPCC	Intergovernmental Panel on Climate Change
lCER	long-term CER	ITTA	International Tropical Timber Agreement
CFRT	Community Forest Retention Trust Account	ITTO	International Tropical Timber Organization
CH ₄	Methane	JI	Joint Implementation
CO ₂	Carbon dioxide	KP	Kyoto Protocol
COP	Conference of the Parties	LCA	Life Cycle Analysis
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (also known as COP/MOP)	LULUCF	Land Use, Land Use Change and Forestry
CPF	Collaborative Partnership on Forests; The 14 members of the CPF are the Center for International Forestry Research (CIFOR), UN Food and Agriculture Organization (FAO), International Tropical Timber Organization (ITTO), International Union of Forestry Research Organizations (IUFRO), CBD Secretariat, Secretariat of the Global Environment Facility (GEF), UNCCD Secretariat, UNFCCC Secretariat, United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), World Agroforestry Centre (ICRAF), World Bank, and World Conservation Union (IUCN). The UNFF Secretariat supports the work of the CPF.	MRV	Measureable, reportable and verifiable
		N ₂ O	Nitrous Oxide
		NAI	Non-Annex I Parties (see above), mostly developing countries
		NFP	National Forest Program
		NLBI	Non-legally binding instruments
		NTFP	Non-timber forest products
		ODA	Official Development Assistance
		OECD	Organization for Economic Co-operation and Development
		PES	Payment for Environmental Services
		PFC	Perfluorocarbons
		REDD	Reducing Emissions from Deforestation and Forest Degradation
		SBSTA	Subsidiary Body for Scientific and Technological Advice
		SFM	Sustainable Forest Management
		TARAM	Tool for Afforestation and Reforestation Approved Methodologies
		UNDP	United Nations Development Program
		UNEP	United National Environment Program
		UNFCCC	United Nations Framework Convention on Climate Change
		UNFF	UN Forum on Forests

- WG I Working Group I (of the IPCC, see above),
assesses the literature on the physical science basis
of climate change
- WG II Working Group II (of the IPCC, see above),
assesses the literature on the impacts, vulnerabil-
ity and adaptation to climate change
- WG III Working Group III (of the IPCC, see above),
assesses the literature on the mitigation of climate
change, i.e. reducing GHG emissions
- WMO World Meteorological Organization

Units and Measures

- GtC Gigatons of carbon
- GtCO₂ Gigatons of carbon dioxide: 1 billion tons CO₂
- MtCO₂ Megatons of carbon dioxide: 1 million tons CO₂
- tC tons of carbon
- tCO₂ tons of CO₂

1 INTRODUCTION

Climate change is widely recognized as one of the most critical challenges the world has ever faced. The Intergovernmental Panel on Climate Change (IPCC) confirmed in its Fourth Assessment Report that there was “new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities” (IPCC, 2007). The IPCC also concluded the world faces an average temperature rise of around 3°C this century if greenhouse gas (GHG) emissions continue to rise at their current pace and are allowed to double from their pre-industrial level. The resulting impacts, even at the lower end of the range given by IPCC, are likely to be severe.

The land use sector, including forestry and agriculture, is an important source of anthropogenic GHG emissions. Land use change, mainly deforestation, contributed to about 20% of the GHG emissions from anthropogenic sources between 1989 and 1998 (IPCC, 2000 and 2007c). When adding all emissions from the land use, land-use change and forestry (LULUCF¹) sector the share is over 30%. In addition, the land use sector has great potential in mitigating climate change.

The role of LULUCF activities in the mitigation of climate change has long been recognized. The United Nations Framework Convention on Climate Change (UNFCCC) recognizes its importance in achieving the goal of stabilizing concentrations of greenhouse gas in the atmosphere and includes commitments relating to the sector. In addition, several articles of the Kyoto Protocol make provisions for the inclusion of land use, land-use change and forestry activities by Parties as part of their implementation efforts and contribute to the mitigation of climate change.

LULUCF will therefore play a key role in any post-2012 international climate change regime emerging from the current negotiating processes under the United Nations. The United Nations Climate Change Conference in December 2007 culminated in the adoption of the Bali Road Map, which consists of a number of forward-looking decisions that represent the various tracks that are essential to reaching a secure climate future. The Bali Road Map includes the Bali Action Plan (BAP), which charts the course for a new negotiating process under the UNFCCC, with the aim of completing this by 2009. It also includes the cur-

rent negotiations under the Kyoto Protocol, and their 2009 deadline, which focus on further emission reduction commitments for industrialized countries.

This paper introduces the key issues and challenges arising from the discussions on LULUCF under the UNFCCC and its Kyoto Protocol. It provides:

- An overview of LULUCF activities, including challenges in the past and present negotiations;
- A review of data and information on the key mitigation options in the LULUCF sector, with particular reference to forestry;
- A summary of the main LULUCF issues currently under negotiation.

LULUCF activities cut across a number of economic and development sectors. They are therefore not only important from a climate change perspective, but also in light of wider development policies, including food security, energy generation and wood production.

¹ In this document, the term LULUCF is used, as all decisions of the UNFCCC are based on this term. The 2006 IPCC Guidelines for National Greenhouse Gas Inventories propose a new term, AFOLU (Agriculture, Forestry and Other Land Use). AFOLU has essentially the same meaning as LULUCF in the IPCC Good Practice Guidelines of 2000 but integrating agriculture and LULUCF sectors (see annex 5, “From LULUCF to AFOLU”).

2. LULUCF ACTIVITIES UNDER THE CONVENTION AND ITS KYOTO PROTOCOL

LULUCF activities are critical for achieving the overall objective of the UNFCCC to avoid “dangerous interference” with the global climate system. As reflected in the provisions of UNFCCC, this will require the application of policies that “cover all relevant sources, sinks and reservoirs of greenhouse gases” (UNFCCC 1992, Article 3.3). The Convention addresses five sectors considered as sources of anthropogenic emissions: industrial processes, energy, agriculture, waste and LULUCF.

The commitments by Parties to mitigate climate change are defined in Article 4. These commitments take into account Parties’ common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances. Article 4 also refers to commitments relating to the LULUCF sector, such as to “develop, periodically update, publish and make available” national inventories of anthropogenic emissions by sources and removals by sinks of all GHGs (paragraph 1(a)). Also included are commitments to promote sustainable management, and promote and cooperate in the conservation and enhancement of sinks and reservoirs of all GHGs, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems (paragraph 1(d)).

2.1 Milestones in the process

2.1.1 Initial discussions

Under the Convention, much of the initial discussion relating to LULUCF focused on GHG inventories. The main issues of concern were how to compile activity data (a particular difficulty for poorer countries with problems in accessing satellite imagery, inventories or historic data) and how, based on this information, to accurately estimate emissions and removals by sinks. During the negotiations that led to the Kyoto Protocol in 1997, many countries highlighted the importance of including sinks and emissions from LULUCF in the Protocol’s commitments, subject to concerns about definitions, timing and scope. However, questions regarding LULUCF were considered too complex and a lack of scientific evidence increased the difficulties during the negotiations.

2.1.2 Adoption of the Kyoto Protocol (1997)

Under the Kyoto Protocol, Annex I Parties² agreed to quantified emission limitation and reduction objectives (QELROs) and LULUCF activities are eligible for achieving these objectives. Annex I Parties therefore must report and quantify emissions and removals by sinks in the LULUCF sector as part of their potential achievement of their targets. Possible LULUCF activities are included in two paragraphs of Article 3 of the Kyoto Protocol, with different methodological and reporting treatments:

- **Article 3.3** refers to afforestation, reforestation and deforestation, and these are mandatory for all Annex I Parties.
- **Article 3.4** refers to additional voluntary activities related to changes in GHG emissions by sources and removals by sinks in the agricultural soils and land-use change and forestry. By the end of 2006, Parties with commitments under the Protocol would have to decide which activities of Article 3.4 they would account towards their mitigation commitments.

These provisions added a number of new questions and issues for discussions, since Parties had to consider in more detail what activities qualified for reporting and as measures to achieve targets and under which reporting requirements. As a consequence, the UNFCCC Subsidiary Body for Scientific and Technical Advice (SBSTA), at its eighth session in 1998, requested the IPCC to prepare a report examining the scientific and technical implications of carbon sequestration related to LULUCF.

This IPCC Special Report on LULUCF, published in 2000, examines how carbon flows between the atmosphere and the five different “pools” (above-ground biomass, below-ground biomass, litter, dead wood and soil organic carbon) and how carbon stocks change over time (see IPCC 2000). Although the IPCC Special Report clarifies many issues, uncertainties regarding the real mitigation potential and limitations of activities under Article 3.4 were still significant.

² The distinction between Annex I Parties (i.e. developed countries) and non-Annex I Parties (i.e. developing countries) corresponds to the Convention. Under the Kyoto Protocol, countries with quantified emission limitation or reduction commitments (38 developed countries and countries with economies in transition) appear in Annex B. Over the years the terms have been used interchangeably. In this document, when referring to countries included in Annex B of the Kyoto Protocol, the term Annex I Parties is used. Non-Annex I Parties (NAI) have no quantified emission limitation or reduction commitments under the Protocol and are not included in Annex B.

2.1.3 Conference of the Parties (COP) 7 (2001)

The Marrakesh Accords, which were adopted at COP 7, provided the “rule book” for the Kyoto Protocol. The Marrakesh Accords provide a forest definition with range thresholds (see Box 1). Each Party is asked to define the national thresholds to be used during the first commitment period (2008-2012). This decision, to be made internally by each party, has a great impact on the mitigation potential of each country. While there may be different forest ecosystems within a country, the definition for the Kyoto Protocol has to be a single one for the entire country.

As an example, let us think about a country with two main ecosystems: savannas and humid forest with a certain level of tree cover degradation that initiated before 1990. The definition of the forest thresholds (forest cover, tree height and minimum area) will make more or less land eligible for future A/R CDM project activities. This and other similar requirements agreed in the Marrakesh Accords represented over the years a challenge for decision makers in all Parties.

The Marrakesh Accords also limit eligible LULUCF activities in the clean development mechanism (CDM) to afforestation and reforestation (A/R). The CDM, one of three flexible mechanisms under the Kyoto Protocol, allows emission-reduction (or emission removal) projects in developing countries to earn certified emission reduction (CER) credits. These CERs can be traded and sold, and used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol. As the CDM was a new market mechanism, the limit on LULUCF activities was subject to much debate among Parties.³

Under the Marrakesh Accords, the total number of credits that an Annex I Party may claim from A/R⁴ project activities under the CDM was limited to 1% of the Party's total emissions in 1990 multiplied by five.⁵ These agreements apply to the first commitment period of the Protocol (2008-2012).

A proposal on “Reducing emissions from deforestation in developing countries and approaches to stimulate action” (REDD) was first considered by the COP in 2005. Since early 2006, discussions under the

Box 1: Key definitions of the UNFCCC relevant to LULUCF

Forest is a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30 % with trees with the potential to reach a minimum height of 2-5 meters at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30 % or tree height of 2-5 meters are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest;

Afforestation is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources;

Reforestation is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.

Source: FCCC/CP/2001/13

³ Other important requirements of importance for NAI are the need of creating a Designated National Authority, and the request for defining how to deal with proving sustainable development in/for the CDM.

⁴ Afforestation and reforestation refer to the enhancement of sinks through the planting of trees on non-forest land and are eligible activities in the CDM (A/R CDM). A/R CDM is ruled, with respect to eligibility, modalities and procedures, by a number of decisions as outlined in annex 5, “Decisional pathway for A/R CDM and REDD”.

⁵ Even though a cap for A/R CDM project activities has been introduced, to date only a few projects have been submitted and the cap of 1% will most probably not be reached until the end of the first commitment period.

Table 1: A comparison regarding LULUCF emissions and removals

Country	Year	Gross emissions*	LUCF emissions	LUCF removals	Net emissions
A	1990	100	25	50	75
	2010	95	25	25	95
B	1990	100	0	25	75
	2010	120	0	25	95

* Gross emissions are from sources not including the LUCF sector

Source: Ward, 2004

UNFCCC process have focused on: the identification of drivers for deforestation; scientific, technical and methodological issues relating to estimating and monitoring emissions from deforestation; and costs and technical barriers for the implementation of activities to reduce deforestation. Parties have also been considering a range of policy approaches and positive incentives and deliberated the advantages and disadvantages of various financing options.

At COP 13, the Bali Action Plan was adopted, which states that: “Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries”. Also at COP 13, another major decision to stimulate action was adopted, which provides a mandate for several elements and actions, including further strengthening ongoing efforts and support for capacity-building, technical assistance and transfer of technology. In 2008, a programme of work is being undertaken on methodological issues, such finding ways to measure forest degradation.

2.2 LULUCF activities in Annex I Parties

Annex I Parties have to fulfil a number of requirements, the most important of which relates to accounting rules and reporting. Under the Kyoto Protocol, Annex I countries are required to identify lands that are afforested, reforested and deforested (ARD) over the period of 1990–2005 and to account separately for net emissions

and removals from each of these land areas during the commitment period.

2.2.1 Accounting rules

The adoption of clear definitions and criteria at the national level is essential to the correct accounting and monitoring of LULUCF activities, since different rules apply to different activities. The emissions and removals from LULUCF activities are accounted according to two main rules:

- **Gross-net accounting** only considers carbon stock changes resulting from the difference between emissions and removals in the commitment period and does not draw comparison with the base year.
- **Net-net accounting** compares emissions and removals connected to a certain activity during the commitment period with emissions and removals during the base year. A credit is created when a net carbon sink can be measured comparing the two different periods.

The examples in Table 1 show how, for country A, a reduction in removals from LUCF sector due to a change in age class of the growing forest for example can mean a huge increase in net emissions even though gross emissions decreased (Ward, 2004). Furthermore, any agreement on which an accountability approach is to be used when reporting mitigation activities in forestry can have an impact on the forest management decisions.⁷

During the Kyoto Protocol’s first commitment period (2008–2012), afforestation, reforestation, deforestation

⁶ The term LUCF refers only to land use changes. LULUCF also includes emissions and sinks from land uses that remain the same.

⁷ The issue of how to account for changes in carbon stocks over time is currently one of the many relevant aspects on how to deal with emission reductions from deforestation and forest degradation in a post-2012 mitigation regime (see chapters 3 and 5).

and forest management must follow gross-net accounting, while net-net accounting rules must be applied to revegetation, cropland management and grazing land management.

The gross-net accounting was applied to forest management for the first commitment period because net-net accounting was seen as disadvantageous for countries where the carbon sinks were projected to decline over time because of saturation. At the same time, a credit cap was established for forest management to avoid the production of credits generated by indirect and natural effects as well as changes in human management prior to 1990 that could be generated in applying gross-net accounting.

At the COP 6 (part II) in 2001, a cap for forestry activities equal to 15% of projected removals, or 3% of base year emissions, was established. Natural and indirect effects are not taken into account for Article 3.3 activities but deforestation must be accounted at the national level as an adverse activity to afforestation and reforestation.

2.2.2 Reporting requirements

Another important requirement for Annex I Parties is reporting. According to Article 4.1 of the UNFCCC, Annex I Parties must submit to the UNFCCC annual inventories of national GHG emissions and removals that are subject to an annual review. The inventories must be reported under standardized formats and must cover emissions and removals from six sectors, including the LULUCF sector.

For LULUCF, the UNFCCC reporting is based on the methodologies presented in the IPCC Guidelines and the 2003 IPCC Good Practice Guidance for LULUCF.⁸ The LULUCF data are presented in the six identified land-use categories (i.e. forest management, grassland management, etc.). For every land-use category, carbon stock changes must be reported. Additional data are required for the Kyoto Protocol reporting that are supplementary to the information reported under the Convention. This additional data and requirements have been agreed during the negotiations under the Kyoto Protocol. In principle the supplementary requirements and methodologies for

measuring, estimating and reporting of activities under Article 3.3 and 3.4 are also described in the Good Practice Guidance for LULUCF.

By the end of 2006, Parties had to provide additional information on the definition of forest that they would adopt at the national level—the so-called minimum dimensional threshold values. They had also to list the Article 3.4 activities that they would elect to report on, information on national monitoring system associated with the elected activities, and information on how definitions are to be applied to national circumstances listing criteria to identify areas qualifying for an activity or the other.

During the Kyoto Protocol's first commitment period, supplementary spatial information on units of land subjected to Article 3.3 and 3.4 activities is to be reported, as well as information on methods and approaches to estimate emissions and removals. Parties must also provide information that demonstrates that Article 3.3 and 3.4 activities are human-induced and have taken place since 1990.

The estimates for GHG emissions and removals for Article 3.3 and 3.4 shall be clearly distinguished from anthropogenic emissions from the energy sector, industrial processes, agriculture, waste and solvent and other product using compiling specific tables for reporting. Absence of overlaps between Article 3.3 and 3.4 activities must be demonstrated and uncertainty of emissions and removals estimates must be documented (IPCC 2003).

Options for using the above mentioned activities for mitigating climate change in a post-2012 regime are discussed in chapter 5 of this document.

⁸ On the basis of the experience using the 1996 IPCC Guidelines for reporting and following a request of the SBSTA, the IPCC prepared the Good Practice Guidance for LULUCF, approved in 2003. The Good Practice Guidance for LULUCF were meant to provide clear methodological guidance for a better selection of methods, to facilitate identification of more significant GHG emission sources, to provide methods for consistent time series that allow quality improvement and control over time, and to facilitate the review process. These materials can be downloaded in various languages from <http://www.ipcc.ch/ipccreports/methodology-reports.htm>.

Box 2: Handling of forests in an Annex I Party: Switzerland

Switzerland informed the UNFCCC Secretariat in November 2006 that it would count forest management as a carbon sink according to Article 3.4 of the Kyoto Protocol. Switzerland has a cap of 1.83 million t carbon dioxide (CO₂) per year to account for forest management. This corresponds to 40% of the total commitment of Switzerland as an Annex I Party. In spite of this potential, there are accounting difficulties: (i) the transaction costs for assessment, monitoring and reporting are high and only acceptable for large forest owners which are in Switzerland in the minority; (ii) the risk of windfalls and thus of creation of a source of GHG-emissions is high due to weather hazards, particularly considering the longer term accounting beyond 2012; (iii) to reduce that risk there is a need of silvicultural interventions that eventually reduces the sink capacity of forests; and (iv) adaptation measures may be eventually needed to regenerate forests and might also reduce the sink capacity.

Switzerland's forests sequestered in average 2.7 million t of CO₂ per year between 1990 and 1999 because of low harvest of wood. Since then, there has been considerable increase of wood harvesting because of increased demand for timber and wood energy, but also due to increased frequency and intensity of storms that lead to increased windfall and insect calamities. It is not clear yet what the sequestration potential of Swiss forests will be in between 2008-2012.

The mitigation of Swiss forests is highest when (i) the standing volume (carbon reservoir) is maintained or increasing; (ii) the yearly increment in wood (carbon sequestration) is fully used; (iii) harvested wood is used with long-term effects (housing, furniture, etc); and (iv) at the end of the production cycle the wood is used as energy source.

With respect to forests in the post-2012 negotiations, it is essential for Switzerland that the assessment methods for forest management be simplified and that the missing link between carbon sink and carbon substitution be considered, e.g. through accounting for harvested wood products (HWP) that could help encourage silvicultural measures without losing the value of the forest carbon sink.

2.3 LULUCF activities in non-Annex I Parties

According to Article 4 of the Convention, both Annex I and non-Annex I Parties have to report their LULUCF emissions as part of their national communications. Information is to be provided using common report formats and in accordance with guidance given by the IPCC.

Providing LULUCF information in the national communications is not an easy task for many non-Annex I Parties. The lack of consistent information is a major concern. Other concerns relate to: a) the fact that the flexibility provided by the IPCC guidance allows Parties to use different methods and tiers which lead to different results; b) Parties do not always provide equivalent information due to the different methods used; c) the information provided and the methods used are not always transparent (this is especially relevant when recalculating inventories over time); and d) given that reporting is obligatory on three GHGs only (CO₂, methane (CH₄) and nitrous oxide (N₂O)), information on the three other relevant GHG emissions, (hydrofluorocarbons (HFCs),

perfluorocarbons (PFCs) and SF₆) is insufficient.

With regard to the mitigation strategy, the CDM is the only flexible mechanism that allows non-Annex I Parties to assist⁹ Annex I Parties in their efforts to achieve their GHG emission reduction targets under the Kyoto Protocol. LULUCF activities included in the CDM are afforestation and reforestation (A/R CDM) as defined in Box 1. While CDM procedures for the other five sectors were already agreed upon between before 2003, rules and procedures that govern A/R CDM for the first commitment period were only finally decided in 2004 (see list of relevant decisions in Annex 4). Hence, it is only since the year 2005 that forest sector stakeholders in non-Annex I Parties can undertake A/R CDM projects according to defined rules. This partly explains the “delay” that LULUCF projects have compared with projects in the other sector eligible in CDM.

The most important elements of the rules and procedures in A/R CDM regulate:

- **The market size for A/R projects**, which is limited during the first commitment period (2008-2012) to 1% of the emissions of each Annex I country in 1990,

⁹ The term “assist” the Annex I Parties is the exact wording in Article 12 of the Kyoto Protocol.

¹⁰ “For the first commitment period, the total additions to a Party's assigned amount resulting from eligible LULUCF project activities under Article 12 shall not exceed 1% of base year emissions of that Party, times five” (FCCC/CP/2001/13, Decision 11/CP.7).

multiplied by five;¹⁰

- **Eligible activities in the LULUCF sector for CDM until 2012**, which are restricted to afforestation and reforestation. Activities in bioenergy are also eligible until 2012 as far as these are undertaken using an approved methodology and considering all other clarifications made by the Executive Board of the CDM with this regard. Forest management and reduced emissions from deforestation are not eligible forestry activities under the CDM;
- **Agreement on the modalities and procedures for CDM projects** in forestry and the process for proposing and getting approved corresponding methodologies;
- **Definition of small-scale projects** and their first simplified methodology; and
- **Baseline and monitoring methodologies for the CDM**, which are to be presented by project developers and approved by the Executive Board of the CDM.

Considering the limited experience in A/R CDM compared with CDM projects of other sectors, it is too early to make an accurate evaluation of the impacts of the A/R CDM on poverty alleviation or in terms of net contribution of A/R CDM within the global mitigation portfolio.¹¹ Even if the carbon market is active, its real development starts only in 2008 with the beginning of the first commitment period. Still, some early observations¹² are worth mentioning.

A/R CDM is a well regulated system that creates additional costs compared with traditionally designed forest plantations; e.g., to assess the carbon potential, new and often complex methodologies need to be developed in the design stage of the project, and the project cycle needs to include many actors and steps that are not yet well known locally. A/R CDM projects require, at least at the beginning, a high level of knowledge of the internationally agreed modalities, procedures and methodologies.

Since such knowledge is presently barely available in many developing countries, there is often a need to engage international expertise, which further increases the project preparation costs. The major part of these costs has to be paid before CDM payments are received. Because of the

mentioned circumstances many developing countries have yet not been in a position to use the A/R CDM, even if they consider it as an attractive option.¹³

A/R CDM has stimulated new interest for planting trees, especially in seriously degraded areas. This can be indeed a new opportunity for the forest sector, as it can open the possibility to promote long-term activities such as restoration of forestland or tree plantations. Nonetheless, the forest sector in many countries is reacting very slowly to the opportunities provided by the CDM, and often A/R CDM activities are proposed without consideration of existing forest strategies. A/R CDM, especially of the small-scale variety, offers a possibility to poor people to get involved, particularly through the promotion of community forestry, which could have an important developmental impact in rural areas. However, for the time being, small-scale A/R projects have proven being largely out of reach for local communities, given the complexity in the design of the project, the legal requirements in respect to property rights on land, carbon pools and carbon credits and the transaction costs involved in project preparation. Thus, currently, almost all existing A/R CDM projects have targeted either publicly-owned reforestation areas or plantations promoted on privately owned land.

The fact that CERs coming from A/R CDM projects are excluded of the EU Emissions Trade Scheme (EU ETS) also implies a considerable constraint in market opportunities for mitigation activities from the forestry sector in developing countries.

In conclusion, mitigation activities in the forestry sector under the CDM have been limited to date. Opportunities to increase activities include simplifying procedures, developing certainty over future commitments, reducing transaction costs, and building confidence and capacity among potential buyers, investors and project participants (Robledo et al. 2008).

¹¹ The reason for this is mainly the lack of overall agreement by Parties on how to deal with LULUCF than delay in implementation.

¹² These observations are based on the authors' experience with the A/R CDM in Latin America, Asia and Africa.

¹³ Some bi- and multilateral development agencies have reacted to this fact and are funding capacity building for the preparation of A/R CDM projects, mainly through workshops, tools development and model project development.

2.4 Lessons learned from LULUCF negotiations

Negotiating LULUCF in the framework of the UNFCCC and its Kyoto Protocol has demonstrated to be very difficult for both Annex I and non-Annex I Parties. While in previous years there was still considerable scientific uncertainty on the potential of LULUCF activities in mitigating climate change, substantial progress has been made in recent years by the IPCC, including the publication of the IPCC Good Practice Guidance (GPG) in 2003 and the IPCC 2006 Guidelines. Additional to the work of the IPCC, a number of tools and instruments to design an A/R CDM project activity are available, also in developing countries (e.g. ENCOFOR toolbox or TARAM for A/R CDM¹⁴). Nevertheless, there remain some important issues that maintain uncertainty about the potential of the A/R CDM. These are related to:

- Technical issues relevant only to forestry activities (carbon accounting, leakage, treatment of environmental and socio-economic impacts etc. See next section for more information);
- Lack of accurate information in many developing countries;
- Link to other critical development issues given wider environmental and social impacts;
- General sense of low governance in the forest sector, especially in developing countries;
- Some Parties argue that LULUCF mitigation options could be used to delay emission reductions in the energy and transportation sectors. This has had a negative influence on how LULUCF activities have been considered in the climate change negotiations over time.

Based on the first experiences with LULUCF, stakeholders directly involved in the implementation of LULUCF activities from Annex I and non-Annex I Parties expressed a desire for simpler or more cost-effective ways to support the overall objective of the Convention through forestry activities. Some Annex I Parties want more flexibility to achieve their targets, while some developing countries would prefer larger markets for CDM or other credits. For

non-Annex I Parties, the issue is about creating appropriate incentives. Negotiations on a post-2012 agreement provide an opportunity to reassess procedures, to extend the list of eligible LULUCF activities, and possibly to simplify the manner in which LULUCF activities are included in the future climate change regime.

The fact that the contribution of LULUCF to Annex I Parties' reduction commitments was agreed after the establishment of Kyoto targets constituted a major difficulty for using the whole potential of LULUCF as a means for mitigating climate change. That happened mainly because LULUCF was seen during the previous negotiations as a way to offset emissions, i.e. to avoid changing energy and consumption paths of the major emitters. **A post 2012 mitigation regime will likely need to include a wider set of eligible activities in non-Annex I countries including agriculture, forestry, and other land uses.**

Chapter 5 explains the current negotiations and how LULUCF is included in the ongoing processes.

Questions:

- How is LULUCF considered in the national communication and/or GHG inventory in your country?
- Has your country participated in the LULUCF negotiations? If yes, how is the process in your country to define positions and negotiation strategies regarding LULUCF in the UNFCCC?
- How was the participation of the forest sector representatives of your country in the UNFCCC negotiations?
- Which are the lessons learned by your country during these negotiations?
- What incentives would be needed for promoting action on LULUCF in your country?
- According to the questions before, do you consider LULUCF as a key sector for your country in future negotiations? If yes, please discuss the kind of support your country will require to be well prepared for the negotiation process.

¹⁴ ENCOFOR (Environment and Community-based Framework for Designing Afforestation, Reforestation and Revegetation Projects in the CDM) tools can be downloaded from http://www.joanneum.at/encofor/tools/tool_demonstration/Tools.htm. The TARAM tool (Tool for Afforestation and Reforestation Approved Methodologies) can be downloaded from <http://carbonfinance.org/Router.cfm?Page=BioCF&FID=9708&ItemID=9708&ft=DocLib&CatalogID=40526>.

3. TECHNICAL AND METHODOLOGICAL ISSUES AND REQUIREMENTS FOR FUTURE LULUCF OPTIONS

As mentioned in sections 2.3 and 2.4, there are a number of technical and methodological issues that have evolved with the negotiations. Technical and methodological issues and requirements for carbon accounting have been developed to accurately quantify the mitigation potential of a particular LULUCF activity. Technical and methodological issues relate mainly to how to define a baseline or a reference scenario, how to treat leakage, permanence and additionality, and how to monitor and report emission reductions or carbon sinks (see the glossary for definitions in Annex 2). These technical and methodological issues might need – in general terms – to be reassessed and complemented according to the LULUCF activities that become eligible in a post-2012 agreement. In particular, there is the possibility that reducing emissions from deforestation and forest degradation (REDD) and/or forest restoration become eligible.

3.1 Carbon pools

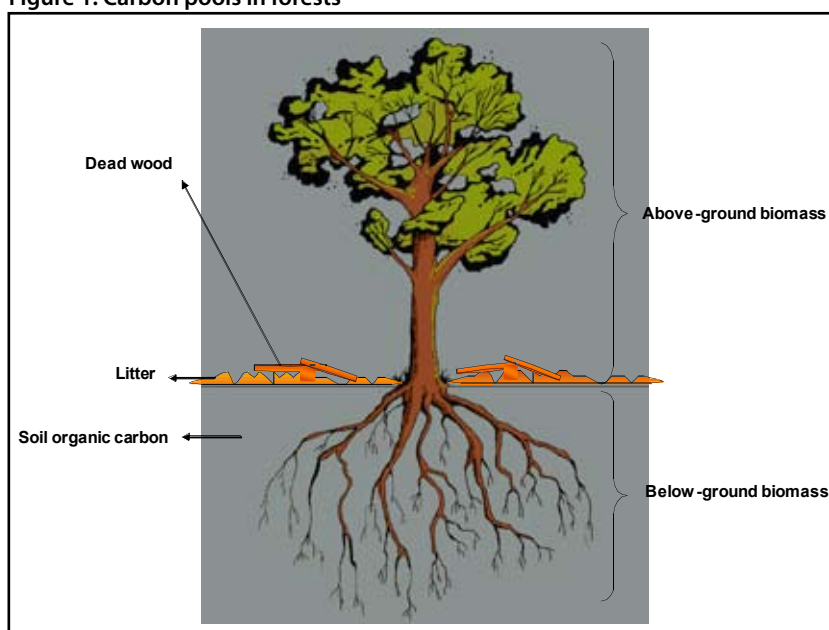
Carbon in forestry mitigation activities can be found and measured in five so called “pools” or “reservoirs.”

These are:

- Below-ground biomass;
- Above-ground biomass ;
- Litter;
- Dead wood;
- Soil organic carbon (see Figure 1).

Ideally, one should collect data of changes in carbon stocks in all five pools, but doing so in an accurate and cost effective manner remains a major challenge. In order to facilitate the calculation of such changes, models and algorithms have been developed, especially for the two first pools. However, basis information on carbon stocks and stock change in each pool remains scarce and/or inaccurate, particularly in developing countries. Hence, Parties to the Kyoto Protocol have agreed that afforestation and reforestation project activities under the CDM (CDM A/R) participants may choose not to account for one or more carbon pools, as long as the excluded pool is not a net GHG emitter (Decision 19/CP.9, later adopted by the Parties to the Kyoto Protocol as Decision 5/CMP.1).

Figure 1: Carbon pools in forests



Source: Robledo et al, 2008

3.2 Baseline or reference scenario

The baseline concept was defined for those project activities to be included in two of the Kyoto Protocol's cooperative mechanisms: Joint Implementation (Article 6) and the CDM (Article 12).¹⁵

A baseline scenario is a term defined for the CDM. It relates to the sum of the changes in carbon stocks in the carbon pools within a given area that would have occurred in the absence of a LULUCF project activity.

For the A/R CDM, three approaches were agreed for estimating the baseline¹⁶:

- (a) Existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary;
- (b) Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment;
- (c) Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time the project starts.

By August 2008, over 90% of the approved A/R CDM methodologies have chosen the approach (a) "historical".

According to the current modalities and procedures for the CDM forestry projects have to define a baseline for eligible activities within the project boundary (local level). The only exception is the "programmatic CDM" that was agreed at COP 11 in 2005. Some countries are currently working an A/R Programmatic CDM (e.g. Pakistan), but there is scarce experience on the opportunities and limitations of this approach. A shift to regional baselines implies a major change in these modalities and procedures for the A/R CDM and will need to be agreed by the Parties to the Kyoto Protocol.

[Discussions regarding baseline in a post 2012 regime \(particularly REDD\):](#)

Baselines are an essential part of any arrangement aiming at REDD as they provide the necessary refer-

ence against which performance can be assessed. For estimating the baseline in REDD activities, two issues should be considered when analysing: scale and time scenario.

- **With regard to the scale of the baseline/reference scenario, there are three levels to consider: local, regional or national.** Local and regional baselines are linked to project activities, while national baselines are based on the possibility to use mainly national policies to reduce GHG emissions. However, it is possible to foresee a combination between these approaches where national baselines could be used as a reference for emission reductions in project activities at the local level. Regardless of whether a baseline is developed at national or project level, it will be important that the methods used are consistent across countries and rather conservative in their assumptions and outcomes, given the broad uncertainties that prevail in its assessment.

- **With regard to the time period, there are two approaches:** to consider only past trends or to consider past and future trends. The first approach is more favourable for countries with high rates of deforestation in the past, as these countries would have the greatest potential for claiming emission reductions in the future (e.g. in the Congo Basin in Africa). The second approach would be more favourable for countries that had a low rate of deforestation in the past but are threatened by a high future deforestation rate.

Another ongoing discussion refers to the appropriateness of baselines at the project level for REDD. Some authors argue that a regional baseline could contribute to increased transparency and accuracy in the estimations as well as to reducing transaction costs (Sathaye and Andrasko, 2007). Most of the current analysis on regional baselines refers to avoiding deforestation activities; there is virtually no experience available for reducing forest degradation, respectively forest restoration activities.

Within the ongoing discussion on REDD, two terms appear without specific definition: baseline and reference scenario. The term baseline has not been defined in this context. Negotiations are now mainly based

¹⁵ Baseline under Joint Implementation and the CDM: «Baseline is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of greenhouse gases that would occur in the absence of the proposed project». (Decisions 16/CP.7 and 17/CP.7).

¹⁶ See Decision 5/CMP.1 Article 22.

on the experience made through the CDM. Similarly, the term “reference scenario” has not yet been defined; neither in the Convention nor in the Kyoto Protocol. It seems that the reference scenario focuses on past (historical) data and extrapolates it into the future, similar to one of the three approaches defined for the CDM (approach 22a: Existing actual or historical emissions as applicable, in Decision 5/CMP.1).

Another important question on the baseline/reference scenario relates to approaches for estimating GHG emissions. As observed in Table 1, the difference between gross and net emissions can be significant. A decision on net or gross emissions needs to consider the wide range of implications of both calculation options. The implications linked to these two different options are currently not clear in the negotiations and should be considered carefully in future sessions before any decision is made.

It is important to recall that all emission reductions and sinks need to be monitored over time. The monitoring reports are those that provide the definitive information on the changes in carbon stocks. Hence the baseline is only an indicative of the emission reductions or removals that are expected from a mitigation activity.

Questions:

- How is the data availability in your country? Is there data on deforestation and forest degradation rates over time? Is there data on land cover by 1999, 2000 and current data.
- With regard to the time period considered when defining the baseline/reference scenario, what approach would be more accurate for your country (only past trends, or past and future)?
- Which would be the best option for your country: Baseline per projects, baseline at the level of a region (e.g. an eco-region) or national baseline. Would it be the same answer for each mitigation option (i.e. reforestation, afforestation, REDD, forest restoration, etc)?

3.3 Leakage

In the A/R CDM, leakage has been defined as the increase in GHG emissions by sources that occurs outside the boundary of a given area (in A/R CDM in the project area) which is measurable and attributable to the particular activities envisaged (Decision 5/CMP.1).

A/R CDM methodologies need to include procedures for addressing and, if needed, for estimating leakage in the baseline and for measuring leakages in the monitoring. Considering that defining the system boundaries for estimating something “outside the boundary of the project” is extremely difficult, A/R CDM approved methodologies have dealt with leakages by identifying the potential displacement of people or products due to the proposed project activity. Based on such analysis the methodologies propose a leakage management area where the potential displacement of people or activities is addressed.¹⁷ Specific tools for estimating leakage according to this approach have been developed by the Afforestation/Reforestation Working Group of the CDM Executive Board (ARWG).

In the discussion on REDD, some are referring to “displacement of emissions” when referring to leakages. As displacement of emissions has not been defined yet in any of the existing decisions, there is a lack of clarity about the differences between “displacement of emissions” and “leakages”.

The main discussion on leakage revolves around differences on how to deal with it, depending on whether the national and/or the sub-national approach is to be used. In general terms, the discussion on leakage tends to accept that if an accurate national baseline/reference scenario and monitoring system can be set at the national level, risks of unaccounted leakage would disappear. This affirmation is based on the idea that if any displacement of activities or communities due to a REDD activity takes

¹⁷ For A/R CDM approved methodologies see http://cdm.unfccc.int/methodologies/ARmethodologies/approved_ar.html

place, national inventories will reflect it. Therefore emissions resulting from displacement will need to be considered in the calculation of the net emission amount for the sector in a country.

Those supporting a sub-national approach (including the possibility for project activities at the local level) argue that good experience has been gained through the treatment of leakage in the A/R CDM, which could be used as a basis for addressing potential leakage in a REDD project.

As for common points for A/R CDM and REDD, one key aspect in the discussion on leakage is how to define what “outside the boundary” means. Is it meant to consider any displacement of GHG emissions within the region, the country or also at the international level?

There is some literature analysing potential international leakage in the forest sector. According to some authors, the international wood trade/wood exploitation can be heavily affected by activities aimed to mitigating climate change (Sathaye and Andrasco, 2007a). This concern has increased after 2005 when the discussion on REDD started, as for some the risk for international leakages due to REDD activities can be so high that emissions reduced in a country could be replaced by emissions in another one.

International leakage has not been considered for any other sector under mitigation yet, even though international leakage in sectors such as energy or transportation could be even higher than in the forestry sector. There are different reasons for it, but perhaps one of the most important is that quantifying and moreover monitoring international leakage would have strong technical and legal implications, e.g. on international liabilities, and therefore it is very difficult to implement.

Questions:

- Which are the major risks of leakages in your country?
- Do you think that these risks can be reduced/addressed at the local level or is it necessary to define procedures and methodologies at the national level?
- What will be the position of your country if international leakages in forestry are to be negotiated in the future? Do you think that international leakage in other sectors should then also be addressed?

3.4 Permanence

The issue of permanence is related to the possibility that carbon in reservoirs can be emitted at any time, making emission reductions non-permanent. Permanence relates to the period of time that carbon remains in the biosphere. Due to different risks, including fires and pests, carbon can be released into the atmosphere, thereby reducing the climate change mitigation effect of a project. The IPCC has clarified that a short-term reduction in emissions has a positive short-term impact in mitigating climate change. However, it is important to promote a permanent effect on the atmosphere. Concerns on permanence are only related to non-Annex I Parties without commitments, because countries with commitments need to regularly report their progress considering all emissions from the LULUCF sector. If a given forest is degraded or a fire occurs, these emissions will be automatically included in the national inventories.

Proposals for dealing with non-permanence in the LULUCF in the future include (a) using temporary credits;¹⁸ (b) banking credits and debits from one commitment period to the next; (c) reducing future financial incentives to take into account emissions from deforestation above the agreed level; and (d) by mandatory setting aside of a share of the emission reductions. Furthermore, some Parties consider sustainable forest management as a means to promote the permanence of emission reductions.

The treatment of permanence is especially relevant if Parties agree on a market mechanism for REDD. In the case of A/R CDM, the question of permanence added to the transaction costs; the experience has also shown that temporary credits are cheaper than permanent credits. Thus, in REDD, the possibility of implementing permanence issues will depend on whether the approach is fund or market based.

Questions:

- Which proposal for dealing with permanence is the most convenient according to the circumstances in your country?

¹⁸ Temporary CERs expire at the end of the commitment period subsequent to the commitment period for which they were issued; long-term CERs are valid until the end of the project's crediting period up to maximum of 60 years.

3.5 Additionality

Additionality¹⁹ is the result of the GHG emissions reduced by the project (project scenario) minus those emissions that would occur in the absence of the project (baseline), minus the leakage caused by the project. It is a term used within the CDM and therefore applies only to project activities undertaken in NAI. Currently, additionality is estimated and monitored using the approved A/R CDM methodologies.

As the current negotiations on REDD are under the Convention and financing solutions for REDD activities is still under discussion, the question as to whether activities in REDD have to be additional or not is open. The same occurs with other mitigation options that are not yet included in the A/R CDM such as forest restoration.

Questions:

- Under which circumstances should LULUCF be additional (e.g. only for projects, or for national activities too)?
- How does national legislation and enforcement affect the additionality of LULUCF activities in your country (e.g. if there is a forest conservation law)?
- In your country, which other forestry projects can affect the additionality of LULUCF activities (e.g. Forest Law Enforcement and Governance - FLEG)?
- What about programmes in other sectors (e.g. infrastructure projects affecting natural forests)?

3.6 Environmental and socioeconomic impacts of mitigation activities

Until now, environmental and socio-economic impacts have been considered only in the A/R CDM. According to Decision 5/CMP.1, project proponents should ensure that there is no potentially significant negative socio-economic or environmental impact from the A/R CDM project activity. If such a potential impact is identified, project proponents must define how to reduce the impact. Further, these potential negative impacts will be then included in the monitoring. The “potential negative

impact” is defined by the host country where the A/R CDM project activity takes place.

Positive socio-economic and environmental impacts (or co-benefits) are not considered in the modalities and procedures and therefore there is no need to report on them.

In Annex I countries, socio-economic or environmental impacts regarding LULUCF activities or activities in other sectors are not ruled under the Kyoto Protocol. Furthermore, CDM projects outside A/R CDM do not need to take into account social impacts. **This means, e.g., that many potential negative impacts of biofuel project activities on social systems are simply not considered, addressed or monitored. This is an issue of concern, especially when discussing the potential of biofuels for substitution (see chapter 4 for biofuels as a mitigation option).**

Questions:

- How are “potential negative impacts” currently defined in your country?
- Do you see a need for identifying and monitoring co-benefits?
- Do you think that socio-economic and/or environmental impacts and benefits are to be considered for other LULUCF activities besides A/R CDM?

3.7 Monitoring and reporting

Maintenance of the reservoirs (pools) needs to be regularly monitored, and under the CDM also verified. These data have to be consistently reported so that a clear quantification of the global emission reductions can be calculated. To do so, reliable methods are needed to accurately assess emission reductions over time. While such methods exist, they tend to be very expensive. The experience in the ongoing A/R CDM shows that monitoring costs can be very high (in some cases 25% of the total project cost). Similar indications have been done by Annex I countries on their costs for monitoring and reporting. **Monitoring and reporting requirements need to be agreed in such a way that accurate quantification of the**

¹⁹ The definition of additionality, as in Decision 17/CP.7, para. 43: A CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

emission reduction over time is possible, while at the same time making technologies and capacity building available for developing countries.

Questions:

- Which forestry activities are already being monitored in your country (for the UNFCCC, UN Forum on Forests (UNFF), Food and Agriculture Organization (FAO) or others)?
- Are there some synergies that could reduce monitoring costs in the A/R CDM?
- How could monitoring and reporting requirements be simplified?

4. MITIGATION OPTIONS IN FORESTRY WITH A FOCUS ON DEVELOPING COUNTRIES

In order to understand the entire potential of LULUCF in climate change mitigation, this chapter summarizes the different options in a systematic way. They all are open to consideration in a post-2012 climate change regime.

In its Fourth Assessment Report, the IPCC concluded that forest-related mitigation activities can considerably reduce emissions from sources and increase CO₂ removals by sinks at a low cost, and can be designed to create synergies with adaptation and sustainable development. Forest mitigation options have to be considered as an immediate option to be applied over the next 20 to 30 years. The longer-term mitigation potential of such options remains, however, unclear. Global change will impact carbon mitigation in the forest sector, but the magnitude and direction of this impact cannot be predicted with confidence over longer period. Global change may affect tree growth and decomposition rates, the area, type, and intensity of natural disturbances, land-use patterns, and other ecological processes.

Forestry can make a very significant contribution to a low-cost global mitigation portfolio that provides synergies with adaptation and sustainable development. However, this opportunity is not being taken fully into consideration in the current institutional context and has resulted in only a small portion of this potential being realized at present (mainly through the A/R CDM).

Forestry mitigation options include reducing emissions from deforestation and forest degradation, enhancing carbon sinks through enhancing the sequestration rate in existing and new forests, providing wood fuels as a substitute for fossil fuels, and providing wood products for more energy-intensive materials. Properly designed and implemented, forestry mitigation options can have substantial co-benefits in terms of employment and income generation opportunities, biodiversity and watershed conservation, provision of timber and fiber, as well as aesthetic, cultural and recreational services. Table 2 presents a simple classification of the mitigation options in forestry.²⁰ For each option, the corresponding forest management approach is specified. The combined effects of reduced deforestation and degradation, afforestation, forest management, agro-forestry and bio-energy have the potential to increase from the present to 2030 and beyond. Thus, they all are important when discussing the implementation of the BAP.

The carbon mitigation potential from reducing deforestation, promoting forest management, afforestation, and agro-forestry differ greatly by activity, regions, system boundaries and the time horizon over which the options are compared (IPCC 2007c IPCC Fourth Assessment Report (AR4), WG III).

Table 1: Mitigation options in forestry

Mitigation options (general)	Mitigation options in the UN-FCCC or its Kyoto Protocol (KP) (LULUCF)	Forest Management Options
Reduction of GHG emissions	Reducing emissions from deforestation and forest degradation (REDD)	Sustainable management of (natural) forests Committing forests for REDD
Carbon sequestration	Afforestation	Plantation, forestry, agroforestry, agro-sylvo-pastoral systems
	Reforestation	
	Enhancement of sinks through forest restoration (not yet clearly defined)	In forested areas: enrichment, planting, guided natural regeneration
Carbon substitution	Substitution through harvested wood products: using forest products for electricity and fuel	Forest Biofuel plantations, sustainable use of wood production

²⁰ It is understood that these mitigation options consider all five carbon pools, including organic soil carbon.

Realization of the mitigation potential requires institutional capacity, investment capital, research and development, and knowledge transfer, as well as appropriate policies and incentives and international cooperation.²¹

Under the mitigation options of reducing emissions and increasing carbon sequestration, there are four forest management options²² to be considered, including:

- Reducing emissions from deforestation and forest degradation (REDD);
- Forest management (sustainable use of existing forests);
- Forest restoration (restoring degraded forest areas to a sustainably used forest);
- Afforestation and reforestation²³ (restoring lost carbon stocks to a sustainably used forest).

Figure 2 illustrates the link between different forest management options. Note that the forest degradation process is defined as the loss of existing carbon stocks through unsustainable use of forest resources. Degraded forests are still considered as forest area and not submitted to any land use change. Nevertheless, most of the existing carbon stock is lost within forested areas through overharvesting of timber, fuelwood and other forest products. Reversing forest degradation through enhancement of sinks is here defined as forest restoration.

The assessment of the potential of any of these forest mitigation options should include the overall policy framework of the sector. Especially important is the analysis of the impact of mitigation options on the availability and quality of forest goods and services and the overall development goals of a given country. International processes and agreements such as the non-legally binding instrument (NLBI) on all types of forest of the UNFF elaborated in 2007 or the 2006 International Tropical Timber Agreement (ITTA) can have potentially a profound impact on the future use of forests resources. Global and regional cooperation programmes such as those from

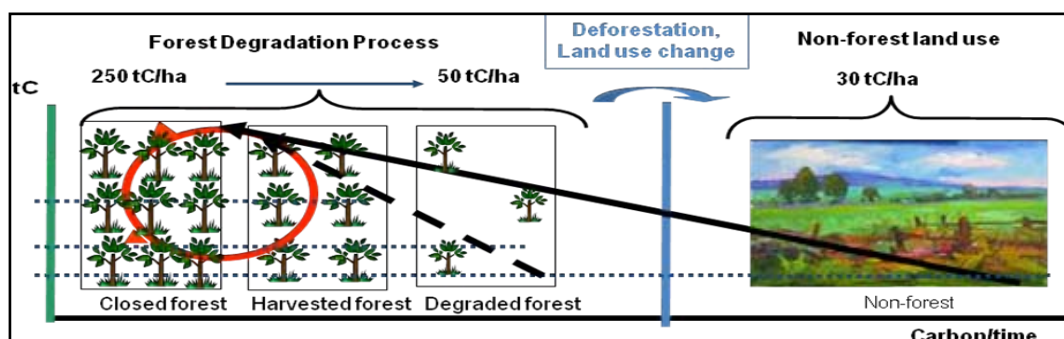
the Collaborative Partnership on Forests (CPF), the Forest Law and Enforcement & Governance (FLEG), the Global Forest Partnership (GFP), both initiatives of the World Bank and more tailor-made approaches towards REDD, such as the Forest Carbon Partnership Facility (FCPF) of the World Bank or the UN-REDD Initiative of FAO, UNDP and UNEP will certainly shape the future LULUCF agenda beyond 2012. Equally important are national legislation and programs resulting from the National Forest Program (NFP) Approaches that define goals and strategies for managing forests at a national and/or sub-national level over decades to come.

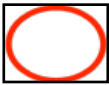
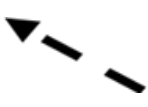

²¹ Many efforts are now underway to provide technology and knowledge transfer. One of the most comprehensive approaches by mid-2008 is the development of the READINESS Plan of the Forest Carbon Partnership Facility of the World Bank (FCPF). More than 20 countries are preparing such plans with considerable financial support of the international community through the FCPF.

²² Other important elements in the overall context of mitigation options in forests are: How to treat reduced impact logging? How to treat "pioneer agroforestry"? How to treat synergies between REDD and adaptation? How to treat the substitution potential of wood products?

²³ In the newest reports of the IPCC and the Secretariat, "agroforestry" has been included in the agricultural sector. Nevertheless, it needs to be clarified that many A/R CDM projects that count under afforestation/reforestation are promoting agroforestry systems.

Figure 2: Illustrative overview of mitigation options in forest management



	Sustainable management of forests (for conservation, timber or multi-use): Keeping a relatively high carbon stock over a specific period of time; this principle is applied for example in a production forest that is managed according to sustained yield criteria. A medium carbon stock is maintained over a rotation period, e.g. 30 years.
	Restoring degraded forests (for regaining the entire range of goods and services): Most of the carbon emissions from forestry happen through forest degradation processes. Restoring lost carbon pools based on close-to-nature silviculture and bringing them back into a sustained yield managed forests or in conservation forests is a major option to enhance GHG sinks.
	Afforestation and reforestation (from non-forests to forests): Planting new forests on non-forest land and bringing them back into a full carbon stocked forest (e.g. through A/R CDM). Forests are artificially created and can include dense plantations of exotic trees or agroforestry systems.

Source: Authors' compilation

Questions:

- Does your country participate in other international processes that make decisions on future use of the forest resources? Which ones?
- How is the forest policy framework in your country?
- At which level are decisions made regarding use and management of forest resources in your country?
- Which forest management option would be the most promising forest mitigation option in your country?

4.1 Reducing emissions from deforestation and forest degradation

In the short term, the carbon mitigation benefits of reducing deforestation can be greater than the benefits of afforestation. That is because deforestation is the single most important source, with a net loss of forest area of 7.3

million ha/yr between 2000 and 2005. Deforestation, as defined in the framework of the UNFCCC, is the direct human-induced conversion of forested land to non-forested land. There is yet no agreed definition on forest degradation in the UNFCCC. Of several variations of definitions proposed by the IPCC, the most recent is a direct human-induced long-term loss (persisting for X years or more) of at least Y% of forest carbon stocks (and forest values) since time T and not qualifying as deforestation or an elected activity under Article 3.4 of the Kyoto Protocol.²⁴

Deforestation (including land-use change) and forest degradation are the main emission sources in many developing countries (Stern, 2007). Latest figures released by the IPCC in 2007 indicate that land use change contributed to more than 20% of global carbon dioxide emissions, of which tropical deforestation very likely makes the largest part. Estimates on their share of

²⁴ See also Annex 1 on key definitions in LULUCF

the total global anthropogenic emissions differ according to the source and the type of activity included (Schlamadinger et al., 2007). Deforestation causes significant GHG emissions – an estimated 7.6 billion tones of CO₂ per year in 2000, about 15 to 20% of all GHG emissions (Baumert et al., 2005). Houghton (2005a) estimates that forest conversion, forest degradation and shifting cultivation altogether were responsible for carbon emissions equivalent to 15 – 35% of fossil fuel emissions in the 1990s. While these figures have a large degree of uncertainty, they stress the relevance of including efforts to combat deforestation in climate negotiations.

In some circumstances, deforestation and degradation can be delayed or reduced through the complete protection of forests (Soares-Filho et al., 2006), through sustainable forest management practices, or by providing economic returns from non-timber forest products and forest uses not involving tree removal.

Protecting forests from all harvests typically results in maintained or increased forest carbon stocks, but also reduces the wood and land supply to meet other societal needs. Reducing deforestation and degradation is the forest mitigation option with the largest and most immediate carbon stock impact in the short term per hectare and year globally. The mitigation costs of reduced deforestation depend on the causes of deforestation (commercial agriculture, subsistence farming, wood extraction), the associated returns from the non-forest land use, the returns from potential alternative forest uses, and on any compensation paid to the individual or institutional landowner.

According to the FAO, the rate of deforestation during the 1990s was 12.9 million hectares yearly, corresponding to emissions of 5.8 Gigatons of carbon dioxide (GtCO₂)/yr (FAO, 2006 and IPCC, 2007c). Nearly all deforestation is occurring in developing countries situated in the tropical and subtropical climatic belt. Figures about forest degradation are inevitably not as detailed. The International Tropical Timber Organization (ITTO) (2002) estimates the extent of degraded forest in the tropics to about 850 million ha, corresponding to 40% of the entire forested area in the tropics. For defining the mitigation potential of REDD until 2030 (UNFCCC 2007a), only the deforestation figure as advanced by FAO has been considered. The regions with the highest emissions from deforestation and forest degradation are situated in the humid and semi-humid tropics, in particular in Africa, Asia and Latin America. In temperate areas and boreal climatic zones forest areas are stable or increasing.

Table 3 summarizes existing data on carbon loss from deforestation. It gives a good characterization of the range of carbon emissions that result from using different assessment approaches. This is precisely the type of data that leaves many negotiators and also scientists wondering about the feasibility of implementing REDD at a national scale when the data are so scattered and weak. However, techniques are today rapidly improving, for example, through considerable efforts of technology transfer programs such as the World Bank's FCPF, UN-REDD and the work in improving remote sensing forest monitoring promoted inter alia by various members of the Collaborative Partnership on Forests.

Table 2: Estimates of carbon loss from forests attributed to deforestation

(from different authors; carbon loss to the atmosphere in Gigatons of carbon per year (GtC/yr) / Gigatons of carbon dioxide per year (GtCO₂/yr))

Region	Fearnside (2000) 1981-1990	Malhi and Grace (2000) 1980-1995	Houghton (2003) 1990s	DeFries et al. (2002) 1990s	Achard et al. (2004) 1990s
America	0.94 (3.45)	0.94 (3.45)	0.75 (2.75)	0.43 (1.58)	0.44 (1.61)
Africa	0.42 (1.54)	0.36 (1.32)	0.35 (1.28)	0.12 (0.44)	0.16 (0.59)
Asia	0.66 (2.42)	1.08 (3.96)	1.09 (4.00)	0.35 (1.28)	0.39 (1.43)
Total	2 (7.33)	2.4 (8.8)	2.2 (8.06)	0.91 (3.33)	0.99 (3.63)

Source: Adapted from UNFCCC, 2007b

As stated earlier, drivers for deforestation and forest degradation differ greatly by activities, regions, system boundaries and the time horizons. A report prepared for the UNFCCC Secretariat (Blaser & Robledo, 2007) quantified the mitigation potential of REDD based on the analysis of the opportunity costs of different use alternatives. This analysis considered a simplified approach to characterize the following direct drivers of deforestation and forest degradation (see Table 4):

- Commercial agriculture (national and international markets);
 - o Commercial crops;
 - o Cattle ranching (large scale);
- Subsistence farming;
 - o Small scale agriculture/shifting cultivation/slash and burn agriculture;
 - o Fuelwood and non-timber forest products (NTFP) gathering for local use, mostly family-based;
- Wood extraction;
 - o Commercial timber (legal and illegal) for national and international markets;
 - o Traded fuelwood (commercial at sub-national and national level).

Table 3: Deforestation and forest degradation (DD) according to direct drivers in the 90s

Main direct drivers	DD (% of total)	Area of DD (Million ha-1)
1. Commercial agriculture		
1.1 Commercial crops	20	2,6
1.2 Cattle ranching (large scale)	12	1,6
2. Subsistence farming		
2.1 Small scale agriculture/shifting cultivation	42	5,5
2.2 Fuel-wood and NTFP gathering	6	0,75
3. Wood extraction		
3.1 Commercial timber (legal and illegal)	14	1,8
3.2 Fuel-wood/charcoal (traded)	5	0,7
Total	100	12,9

Source: Based on UNFCCC 2007 and 2007a; and Blaser and Robledo 2007
Database used: FAO-FRA 2000 and 2005

Calculating the cost of implementing REDD is extremely difficult and explains the wide variations in estimates. When using the opportunity cost of direct drivers as a basis for the calculation, and if emissions from deforestation and forest degradation are to be reduced to zero by 2030, a minimum investment of \$12.2 billion²⁵ per year would be necessary to compensate the opportunity costs of deforestation and forest degradation (UNFCCC 2007a). According to this calculation, an average price of \$2.80/tCO₂ will cover the opportunity cost of deforestation and forest degradation of 8.5 million of hectares yearly. This would represent an emission reduction of -GtC 3.76 tCO₂/year (65% of the emissions). For this scenario, the price of \$2.80/tCO₂ will also improve livelihood conditions in many regions, as this price is higher than the opportunity cost of the poverty-driven deforestation and forest degradation. Such an improvement would depend on various factors, especially on the administration and transaction costs of REDD activities and the specific conditions of each region (socio-economic, institutional, access to infrastructure, etc.) (UNFCCC 2007a).

When the highest marginal cost to completely stop deforestation – the “choke price” – is applied to the projected deforestation to estimate the cost of reduced deforestation prices vary between \$11 to 77 per tCO₂ (excluding transaction costs) (Sathaye et al. 2007). Applying those prices (to the projected emissions due to the loss of primary forest in each region) yields a cost of \$25 to 185 billion per year to stop deforestation (UNFCCC 2007a and Trines 2007).

Effective implementation of REDD faces a number of methodological problems. The key ones – as summarized from the analysis in chapter 3 – are the following:

- **“Leakage” or “Displacement”.** This is the possibility that carbon emissions avoided in one location will simply relocate to another location (an issue for any carbon emission mitigation approach). The avoidance of displacement is a justification for adopting a national framework for REDD implementation rather than, or in addition to, a project-based approach,

because calculation of carbon credits on a national level would take account of domestic leakage.

- **Permanence.** Because of the possibility that forests might be destroyed through fire or other natural calamities, or through increased pressures on forest land, there is no guarantee of a permanent carbon reservoir and CO₂ sequestration, leading to debate over whether REDD carbon credits should be temporary or permanent. However, as Watson, Noble et al. 2000, section 2.3.6.2, show, even a one-time reduction in deforestation rates will have a permanent effect on atmospheric carbon levels, unless the baseline deforestation rate is exceeded.
- **Establishment of baseline/reference scenarios.** This issue refers not only to the methodological issues of measuring baseline or reference scenarios, but also their appropriate definition, as the establishment of generous baseline levels would benefit both suppliers and buyers of subsequent carbon credits. Also, countries that have historically chosen to address deforestation rates should not be penalised for this form of “early action”.
- **The relative role of market-based and non-market financial mechanisms.** While market-based approaches will most probably play a major role in REDD, many developing countries face significant needs to build necessary capacity for which market-based funding is hardly at disposal. A system to ensure equitable sharing of benefits accrued from sale of credits derived from REDD needs to be established. There are also political issues related to the idea that the carbon market could constrain national sovereignty in determining land use and forest management policies.

The relative advantages of national or project-based REDD frameworks, or a hybrid of the two, needs to be assessed in order to develop an effective and comprehensive implementation system. Similarly, the role of temporary and permanent credits needs to be resolved, as do the methodological issues related to the establishment of baseline or reference scenarios.

²⁵ \$1 Billion = \$1000 Million

Questions:

- How do you assess the emission reduction potential of REDD in your country?
- What are the capacity needs in your country for the development of a national and a project-based approach to REDD?
- What institutions could be used or need to be developed in order to ensure equitable sharing of benefits derived from carbon credits earned through REDD?
- What is the baseline/reference scenario, and how would you assess it in your context: net or gross emissions?
- Discuss and evaluate: national baseline scenario, sub-national and project baseline scenario. What are the opportunities and risks?
- Have there been any early actions in your country to address REDD?

4.2 Forest management²⁶

Forest management, as defined by the UNFCCC, is a system of practices for the stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner.

Forest management activities include silvicultural interventions that promote a greater proportion of the desired species, tree population and size structure, which in terms of timber means promoting the maximum volume of usable growing stock and, therefore, of carbon which may not be released to the atmosphere. They also include harvesting systems that maintain partial forest cover, minimize losses of dead organic matter or soil carbon by reducing soil erosion, and avoid slash and burning and other high-emission activities. Replanting or natural regeneration promotion after harvest or natural disturbances accelerates tree growth and reduces carbon losses. Economic considerations are typically the main constraint, because retaining additional carbon on site delays revenues from harvest (IPCC 2007c). The use of fertilizers or drainage of forest soil (especially in peat

lands) can have a negative effect on the overall carbon balance and should, therefore, be minimized. Moderate drainage, however, can lead to increased peat carbon accumulation (Minkkinen et al., 2002). Landscape-level carbon stock changes are the sum of stand-level changes in the different pools, and the impacts of forest management on carbon stocks ultimately needs to be evaluated at a landscape level. Increasing harvest rotation lengths can increase some carbon pools (e.g. tree boles) while decreasing others (e.g. harvested wood products) (Kurz et al. 1998).

The basic assumption is that the production forest area in 2030 will be the same as today. The basis for the cost estimates for this to be achieved is the ITTO Expert panel report on estimating the costs to achieve the ITTO Objective on Sustainable Forest Management (SFM).²⁷ This report was produced in 1995, based on an analysis using Criteria and Indicators for SFM. The ITTO report estimated the costs of SFM for all tropical production forests in ITTO member countries (about 350 million ha.) at \$6.25 billion. Considering present values (2007) and applying a 5% devaluation factor, this would correspond to about \$12 per ha by the year 2030.

For non-Annex I tropical and subtropical countries, the cost estimate for achieving sustainable forest management would therefore be around \$7.3 billion. For non-Annex I countries with temperate and boreal forests that have potential to increase carbon stocks through forest management, the amount of \$20 per ha⁻¹ (as indicated by Whiteman, 2006), an additional \$1 billion can be estimated as cost of forest management for these countries.

In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks while producing an annual sustained yield of timber, fibre or energy from the forest will generate a meaningful sustained mitigation benefit.

Most mitigation activities require up-front investment with benefits and co-benefits typically accruing for many years to decades.

²⁶ This subsection is based on the report prepared by Blaser and Robledo for the UNFCCC Secretariat, which was used as input for the "Background paper on analysis of existing and planned investment and financial flows relevant to the development of effective and appropriate international response to climate change" (UNFCCC, 2007a).

²⁷ See ITTO at: <http://www.itto.or.jp>

Questions:

- How do you assess the mitigation potential of forest management in your country?
- What is more convenient for your country: a national or a project based approach?
- What is the baseline/reference scenario, and how would you assess it in your context: net or gross emissions?
- Are there ongoing or planned programs on (sustainable) forest management in your country?

4.3 Forest restoration

Forest restoration is a combination of planting trees and human-induced natural regeneration within a degraded forest area that has lost most of its carbon stock.²⁸ Forest restoration thus is a strategy applied in degraded forest areas. Forest restoration aims to enhance and accelerate natural processes of forest regeneration (including carbon stocks) in order to regain the desired species composition and growing capacity of the forest ecosystem. In terms of mitigating climate change, forest restoration becomes complementary to reducing emissions from reducing forest degradation. One could try to reduce as far as possible emissions from degradation. In those areas where such a strategy is not completely successful, and where degradation has already taken place, one would need to restore the forest. Under current conditions there is a huge area of degraded forest that could be restored while improving overall livelihood conditions (including biodiversity, long-term income and health).

Table 4: Estimated extent of degraded forest landscapes by category in Tropical Asia, Tropical America and Tropical Africa (million ha) in year 2000*

	Asia (17 countries)	America (23 countries)	Africa (37 countries)	Total
Degraded primary and secondary forest	145	180	175	500
Degraded forest land	125	155	70	350
Total	270	335	245	850

Source: Blaser and Robledo, 2007, based on Blaser and Sabogal (2002): ITTO Guidelines for Forest Restoration and Secondary Forest Management.

*Authors' estimates. Based on FAO (1982, 1990, 1995, 2001); Sips (1997); Wadsworth (1997); WRI-World Bank (2000). In tropical America, about 38 million ha are classified as secondary forests. For the other regions it is not possible to distinguish between degraded primary forests and secondary forests.

²⁸ In the context of forest management, forest degradation is the reduction of the capacity of a forest to produce goods and services. 'Capacity' includes the maintenance of ecosystem structure, functions and carbon stocks (ITTO, 2002a).

The potential of forest restoration can be summarized as follows:

- Forest restoration is an issue in all non-Annex I countries where REDD is considered;
- The forest restoration potential is estimated to cover about 850 million ha;
- Considering an average carbon stock of 30 tC/ha in living carbon pools (above and below ground biomass) in degraded forests, this amounts to 25 GtC for the pantropical area;
- Fully stocked, these 850 million ha would amount to 57 GtC;
- Hence the maximum carbon stock restoration potential through restoration of degraded forest would amount to 32 GtC.

Taking a price of \$12 per ton of carbon, as paid today by some of the CDM A/R projects, there would be an additional potential cost of about \$38 billion that has not been included in the A/R CDM for the first commitment period. Still, this activity can be considered for a post-2012 forest mitigation regime.

Questions:

- How do you assess the sequestration potential of forest restoration in your country?
- What is more convenient for your country: a national or a project based approach?
- What is the baseline/reference scenario, and how would you assess it in your context: net or gross emissions?
- Are there ongoing or planned programs on forest restoration in your country?

4.4 Afforestation and Reforestation

Afforestation, as defined in classical forestry science, is planting trees on non-forested land (afforestation) or on forested land without trees in 1990 (reforestation).²⁹ As noted above, under the UNFCCC, these two terms have a particular definition and have been used as such for A/R CDM. Both terms, in the LULUCF context, refer to

planting trees on land that is defined as non-forests.

In general terms, afforestation and reforestation initiatives have been driven mainly by the private sector for undertakings such as commercial plantation forestry, or by governments, particularly for soil and watershed protection. The drivers that influence afforestation and reforestation vary according to region and often even within a country.

A particular form of A/R CDM is the use of agroforestry. Agroforestry refers to the planting of trees among or around crops or on pasture land as a means of preserving or enhancing the productivity of the land. In many parts of the world, smallholder agroforestry systems are tree- and species-rich systems producing non-wood and wood products for both home use and market sale. These systems can sequester large amounts of carbon that are retained in the biosphere over time. While the individual systems may be of limited size, on a per area basis smallholder systems accumulate significant amounts of carbon, equal or beyond the amount of carbon stored in degraded forests. Their ability to simultaneously address smallholders' livelihood needs and store large amounts of carbon makes smallholder agroforestry systems viable project types under A/R CDM, with its dual objective of emission reductions and sustainable development. Simplified smallholder A/R CDM projects based on agroforestry concepts still needs to be refined, in particular with respect to the bundling of approaches and to the acceptance of a carbon accounting approach at landscape level.

Sathaye et al. (2006) projected the potential land area planted and the removals by sinks (including planting forests and agroforestry systems) benefits across a number of scenarios relative to 2100 and compared them to a reference scenario. For 2050 the range of land area planted is between 52 and 192 million ha whereas the carbon benefits range from 18 to 94 million t of CO₂. According to the same authors, the forest establishment costs range from \$654 per ha to \$1580 per ha (ORNL 1995). Using this range, the initial investment required for mitigation equivalent to 18–94 million t CO₂ through afforestation/reforestation on 52–192 million hectares of

²⁹ The European Environmental Agency recently defined forest plantations as forest stands established by planting or/and seeding in the process of afforestation or reforestation. They are either: a) of introduced species (all planted stands), or b) intensively managed stands of indigenous species which meet all the following criteria: one or two species at plantation, even age class and regular spacing. It excludes stands which are established as plantations but which have been without intense management for a significant period of time; these should be considered semi-natural.

land would be \$34–303 billion. The IPCC WG III AR4 estimate of the mitigation potential of afforestation by 2030, i.e. 1,618 to 4,045 Mt CO₂/ year, is substantially lower than the estimate of Sathaye et al. (2006). Using a similar ratio between carbon sequestered and hectares planted, the WG III AR4 estimates would require 4.6–8.2 million ha. At establishment cost of \$654–1580 per ha that would be \$3–12.9 billion or \$0.1–0.5 billion per year over 25 years.

Questions:

- How do you assess the sequestration potential of afforestation and reforestation activities in your country?
- What is more convenient for your country: a national or a project based approach?
- What is the baseline/reference scenario, and how would you assess it in your context: net or gross emissions?
- In your country, do there exist tree planting programmes and what are their purposes?
- Which would you see as promising LULUCF activities for a post-2012 climate regime?

4.5 Substitution and the use of forest biofuel³⁵

Mitigation options in the forestry sector include extending carbon retention in harvested wood products, product substitution and producing biomass for bioenergy. This carbon is removed from the atmosphere and is available to meet society's needs for timber, fibre, and energy. Biomass from forestry can contribute 12-74 EJ/yr to energy consumption, with a mitigation potential roughly equal to 0.4-4.4 GtCO₂/yr depending on the assumption of whether biomass replaces coal or gas in power plants (IPCC 2007 AR4, WG III).

Forest biofuel refers either to energy carriers derived from processed or unprocessed plants biomass, such as the plantation of *Jatropha* and other forest trees and shrubs or to so-called second generation biofuels -that is deriving biofuels from cellulosic material, in particular from wood. Bioethanol and biodiesel are the most common forms of biofuels. For the forestry sector, wood substitution,

ethanol from wood (second generation biofuels) and biodiesel from vegetable oils from trees and bushes (e.g. palm oil or *Jatropha*-oil) are the most important options.

Recently, the commercial use of biomass for bioenergy has received a boost from high oil prices and the policies that governments have initiated to promote renewable energy sources. Over the past few years, the areas under biofuel plantations have increased dramatically around the world, particularly of soybeans and oil palm. This latter produces more oil per hectare than any other oilseed, and can be blended directly with petroleum-based diesel, producing a cleaner fuel. Malaysia and Indonesia account for 85% of the palm oil produced worldwide (Carrere 2006).

Rising demand for intensively produced biofuel outside forests, such as palm oil, will decimate biodiversity unless producers and politicians can work together to preserve as much remaining natural forest as possible. Even if recognising that tree crops have a considerable mitigation potential, some aspects need to be taken into account when assessing the overall benefits for sustainable development:

a) Potential impacts on deforestation

Because palm oil plantations are often established after natural forests have been logged and then burned to clear the land for planting, the increasing area under plantations of oil palm may seriously threaten the remaining tropical forests in some developing countries. Furthermore, large parts of palm oil producing countries in South East Asia consist of peatlands, initially covered by rainforests. Rainforest peatlands are rapidly being destroyed through deforestation and drainage for plantations (mainly oil palm and pulp wood).

In other regions (e.g. Latin America), forests are being cleared to extend the area under soybean cultivation.

While the market for soybeans has been traditionally for food and animal fodder, there is an increasing interest in using this crop to produce bio-diesel.

³⁰ Biofuels are considered normally under the energy sector. This short section intends to present the issue as it is relevant for policy makers in the forest sector. It is not a comprehensive presentation nor an analysis on the potentials for and difficulties in using biofuels as a means for mitigating climate change.

b) Potential impacts on food security

There are considerable concerns on the impacts of biofuel production on food prices and hence global food security. This concern is based on the fact that producing crops for biofuels increases competition on available land and food production. Since available land is a limited good, the market price and changes in demand of a given forest product has a great impact on decisions regarding which crop should be produced and/or brought to which market (Peskett et al., 2007).

If, for example, demand for *Jatropha* seeds increases due to a boom in the biodiesel market, *Jatropha* plantations, which are normally done on “waste land” will become competitive for agricultural land (Von Braun and Pachauri, 2006). The impact on the global food market has already been felt during the first semester of 2008. Further stress to the food market will increase social discomfort and augment social disparity worldwide.

c) Integrated environmental impacts of biofuels

Besides the GHG balance, other environmental impacts need to be carefully understood when discussing the possibility of using biofuel. Impacts on soil degradation, resource depletion, biodiversity loss, ecotoxicity, air pollution and water contamination have been included in a research study using the Life Cycle Analysis framework (LCA) by Zah et al. (2007). According to this report, to date almost all biofuels are beyond the environmental benchmark for fossil fuels. If the environmental integrity of the Convention is to be maintained, a better understanding of the real potential impacts of biofuels needs to be ensured before promoting large biofuel programmes for mitigation.

Questions:

- Do you have information regarding the potential for biofuel crops in your country?
- Is there any program supporting biofuel production in your country?
- Is the promotion of forest biofuels a priority in your country?
- Are you aware of the environmental and/or social impacts due to forestry biofuel production in your country?

5. OVERVIEW OF EXISTING POLICY OPTIONS

Currently there are three major negotiation processes under the UNFCCC: the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP), the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) and the ongoing discussions under SBSTA. At COP 15 in 2009, these discussions should converge on a consistent agreement for a post-2012 mitigation regime.

This section will first present the way LULUCF issues are considered in these ongoing negotiation processes. After that, some more detailed analysis of the policy options on REDD, as well as other mitigation options in forestry, will be presented.

5.1 Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP)³¹

Article 3.9 of the Kyoto Protocol establishes the need to consider future commitments for Annex I Parties at least seven years before the end of the first commitment period. The AWG-KP was created for pursuing this aim. Results should be ready for adoption by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP) at the earliest possible time to ensure that there is no gap between the first and second commitment period of the Kyoto Protocol.

Under this negotiating process, there is a specific agenda item on LULUCF, where all activities included in Article 3 of the Protocol are under discussion. The following are under consideration:

- Activity-based approach based on Article 3.3 and 3.4 of the Kyoto Protocol;
- Land-based approach based on reporting under the Convention;
- Harvested wood products (HWP).

Besides, potential new activities such as wetland management, restoration and degradation and forest

degradation are included in the discussions. Key elements in the discussion include the possibility or need for using discounting factors limiting the magnitude of LULUCF for Annex I Parties' compliance and many legal aspects. Conclusions and decisions of this process are bound to have impacts on monitoring and reporting requirements for LULUCF in Annex I Parties.

5.2 Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA)³²

The AWG-LCA was created to conduct the comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, as agreed in the BAP, Decision 1/CP.13). Regarding forests, the BAP includes in paragraph 1(b)(iii):

Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries;

In the majority of the submissions for the first meeting of the AWG-LCA, LULUCF is mentioned as an important option for mitigating climate change.³³ The major issues for discussion are:

- Which activities to include. In the submissions, the following activities were mentioned when discussing mitigation options in developing countries: REDD, forest conservation, sustainable forest management and enhancements of sinks. Some Parties also mentioned afforestation and reforestation as well as forest management
- Consequences on reporting measurable and verifiable emission reductions and enhancements in stocks.
- Need for consistency with the ongoing work under the AWG-KP.

³¹ Bear in mind that only Parties that have already ratified the Kyoto Protocol participate in this negotiation; that is the Parties acting as the meeting of the Parties (CMP) of the Kyoto Protocol.

³² All parties in the Convention participate in this negotiation (this process distinguishes between developed and developing countries).

³³ These documents can be downloaded under <http://unfccc.int/documentation/documents/items/3595.php#beg>.

5.3 Ongoing discussion in the SBSTA with regard to REDD

In accordance with Decision 2/CP.13, the SBSTA started a programme of work on methodological issues related to a range of policy approaches and positive incentives for REDD. Parties have been asked to provide their views on outstanding methodological issues, including: assessments of changes in forest cover and associated carbon stocks and GHG emissions; incremental

changes due to sustainable forest management; demonstration of reductions in emissions from forest degradation; implications of national and sub-national approaches, including displacement of emissions; options for assessing the effectiveness of actions. There is a clear link between this process and the work of the AWG-LCA. It is, therefore, of key importance that policy makers keep consistency in their positions when participating in these two processes. Submissions made by Parties point to priorities for discussion (see Table 6).

Table 5: Issues under current discussion

The issues	The discussion
Activities to be considered	Some parties would like to concentrate on deforestation and forest degradation as they consider that other potential activities bring many uncertainties to the discussion. Others also want to consider conservation, sustainable forest management and/or enhancements of sinks.
Definitions	The definition of forest has a great impact on REDD as well as on the potential for all other mitigation options in forestry. It is imperative to clarify which definition should be used. Some Parties highlight the need of having a definition that addresses different national circumstances and different ecosystems types within a country. The definition of other terms such as degradation, sustainable forest management and conservation also needs to be clarified in the context of mitigating climate change.
National and sub-national approaches	Some Parties favor national approaches, while other Parties highlight the need to include also sub-national approaches with a certain level of flexibility. Issues for argumentation are treatment of emissions displacement, monitoring requirements, accuracy and treatment of uncertainties.
Reference scenario or baseline	The reference scenario seems to be linked to historical data while the baseline seems to include also future trends. For those countries with a high deforestation rate in the past, the reference scenario appears to be a more adequate option while for those countries with potential increments in deforestation rates in the future the possibility to build up a baseline considering these future trends looks more adequate.
Measurable, Reportable and Verifiable (MRV) requirements	This issue is discussed under the monitoring requirements. The discussion in the submissions is how far satellite imagery is enough (in terms of adequacy of the technology and installed capacities in developing countries) and/or how other monitoring tools and existing information can be used (e.g. inventories, ground check, etc).
Funding mechanism	This concerns the possibility of having a market mechanism or of creating a fund for REDD compensation. In both cases, it is assumed that some kind of payment needs to be considered as a key incentive for REDD (see Table 8 for a detailed information on the mechanisms that have been discussed).
Effectiveness of support given by Annex I countries	In the submissions, Parties refer to the need to have clarity about the criteria for support, the amount of resources invested and a way for assessing its effectiveness.

5.4 Policy Instruments and Approaches

In the discussion on policy instruments and approaches, two elements need to be differentiated: the kind of policy instruments that can be used for tackling emissions of GHG from deforestation and forest degradation; and the level on which this instrument is to be applied—local, regional or national (see Tirpak et al. 2008). What kind of instrument can be used for accommodating forestry mitigation options, including REDD, in a post-2012 regime? Within the UNFCCC and according to the ongoing processes explained before, we can identify three options that have different advantages and disadvantages (see Table 7):

- **The CDM:** Currently, only afforestation and reforestation are eligible LULUCF activities under the CDM. In a post-2012 regime, the mechanism could have other eligible activities from the forest sector. Given that the CDM is a project-based mechanism, the level of action will be mainly local. A national approach would be used in the case of developing a sectoral CDM in forestry. Funding would depend on the market for emission reductions, since the CDM is a market mechanism. The major issue under this scenario is the appropriateness of the modalities and

procedures for the A/R CDM as stated in Decision 5/CMP.1.

- **A new cooperative mechanism within the KP:** This alternative foresees the introduction of a new mechanism under the Kyoto Protocol.³⁴ In this case, Parties would have more flexibility to agree on specific definitions for forestry activities, since specific definitions can only be set for this new mechanism. Additionally, Parties will be free to decide at which level each mitigation option should be addressed. Further, agreement on modalities and procedures would depend on the architecture of the mechanism. However, only Parties that have ratified the Kyoto Protocol would be eligible for participating in such a mechanism.
- **A new protocol:** This case provides the greatest number of possibilities for setting commitments (voluntary or not), definition of activities, mechanisms, modalities and procedures. Besides, all Parties to the Convention could participate in a new protocol. However, many issues would then need to be negotiated. A potential new protocol should be seen within a wider perspective and taking into account all potential mitigation sectors.

Table 6: Main positive and negative aspects of different policy instruments

Options	Advantages	Disadvantages
An eligible activity under the CDM	<ul style="list-style-type: none"> • Proven ability of the CDM to provide incentives for action • Institutional framework already in place 	<ul style="list-style-type: none"> • A political agreement is not likely • Technical hurdles • Limited to project-based action • Uncertainties related to the international price for carbon as a major driver for action.
A new mechanism under the Kyoto Protocol	<ul style="list-style-type: none"> • Ability of the GHG market to provide incentives for action • Flexibility within Kyoto Protocol limits 	<ul style="list-style-type: none"> • Controversy could lead to less flexibility in the design • Technical hurdles as for the CDM
A second protocol	<ul style="list-style-type: none"> • Flexible to accommodate realities beyond climate change (i.e. biodiversity) 	<ul style="list-style-type: none"> • No institutional framework exists • No clarity about modalities and procedures • Many issues to be negotiated before action can take place.

Source: Forner, Blaser, Jotzi and Robledo (2006), modified.

³⁴ There are three flexible mechanisms defined by the Kyoto Protocol. Article 6 defines Joint Implementation; Article 12 defines the Clean Development Mechanism; and Article 17 defines International Emissions Trading. For more information see: <http://unfccc.int/resource/docs/convkp/kpeng.pdf>

Regarding positive incentives, the following options have been considered in the submissions: direct regulation (e.g. national policies), taxes and subsidies, transfer payments and permit trading. While taxes and subsidies are defined at the national level, regulation for transfer payments and permit trading can also be agreed at the international level. There is some literature analysing the pros and cons of each of these incentives (e.g. Kaimowitz and Angelsen 1998, von Amsber 1998, Lele et al. 2000, Espach 2006, Forner et al., 2006). One common conclusion is that a given incentive is not better or worse per se, but its success depends on the overall institutional framework as well as on the possibilities to enforce the institutional agreements at various levels and to monitor results.

Questions:

- Which policy instruments have been used in your country in the forest sector? Is there any evaluation/assessment available for these policies?
- Which incentive mechanisms have been used in your country in the forestry sector? Is there any evaluation/assessment available of these instruments?

5.5 Financing Options

There is general agreement that any mechanism for promoting mitigation options in the forest sector in developing countries should include the provision of new and additional financial resources. However, there are different positions on where these resources should come from and which kind of mechanism should be agreed. Many submissions include proposals on financing mechanisms for REDD (see Table 8). How far these proposals could include other forestry options has not yet been discussed. The following are the key issues and points considered during the discussions REDD:

- Possible sources of funding include: official development assistance (ODA), establishment of funds, multilateral sources, public-private partnerships, payment for environmental services (PES) and market mechanisms;
- Non-market financial resources are acceptable for the majority of the Parties, but funding will generally be limited. Market-based approaches facilitate private sector participation and are more likely to be long-term and sustainable;

- Consideration of approaches to reward actions on REDD needs to be broad and include several alternatives.
- There is a need for additional and innovative financial mechanisms, as well as for reinforcing existing support.
- Up-front financing is needed for institutional and technical capacity building, technology transfer and pilot activities.
- Implementation of actions on the ground requires long-term, sustainable funding.
- It is important that rewards or/and compensation reach “actors” on the ground.
- Governance of the forest resources will play a major role in all forest mitigation options.
- Funding should be provided for demonstrable emission reductions from reduced deforestation.
- There is the concern that market based approaches could devalue the price of existing carbon credits (under the believe of some that forest based carbon could flood the market).
- A new supply of credits must be met by new demand created by deeper reduction commitments by Annex I Parties.
- Any funding mechanism should ensure permanence of emission reductions and/or enhancement of sinks.

Questions:

- Which are the advantages and challenges of market mechanisms for your country? Which are the advantages and disadvantages of funds? Which financing option seems to be more appropriate?
- Do you have upfront financing mechanisms for forestry activities in place in your country?
- Which other kind of taxes and subsidies are used in the forestry sector in your country?

Table 7: Some proposals for funding mechanisms on REDD

Types of mechanism	Characteristics
REDD Mechanism	<ul style="list-style-type: none"> • Accounts for gross carbon emission reductions and non-CO₂ emission reductions only in existing forest areas on a national basis. • Market Mechanism (higher accuracy and value) and/or non-market incentives (lower accuracy and value) • Voluntary policy approaches. • Gross reductions of GHG emissions against a reference scenario (defined as a function of the emissions rate and a development adjustment factor) for a reference period. • Nationally-based. However, it could be implemented synergistically with the project-based A/R CDM.
REDD Stabilization Fund	<p>Accounts for carbon emissions and removals and non-CO₂ emissions in countries participating in the REDD Mechanism that seek to maintain and stabilise existing forest areas on a national basis. It is meant to be especially useful for countries with low deforestation and forest degradation rates and for the maintenance of forests.</p> <p>New and additional funding as:</p> <ul style="list-style-type: none"> • A levy on Emission Reduction Units (similar to that imposed on the CERs generated under the CDM). • A tax on carbon intensive commodities and services. • New and additional ODA.
REDD enabling Fund	<p>A special purpose group of funds designed to prepare and support developing countries that seek to participate in the mechanisms above, including through piloting activities. It is meant to create capacities in some developing countries so that they can participate in a REDD system.</p> <ul style="list-style-type: none"> • Means: new and additional financial resources • Three voluntary tracks: REDD non-market (or fund-based) mechanisms; REDD market-based mechanisms; and REDD stabilization instrument • REDD is considered solely under the Convention. Therefore, no mechanism aimed at fulfilling commitments by Annex I countries. • Related to "avoided deforestation" or "conservation." • Based on voluntary reductions by developing countries. • Seeks positive incentives for the net reduction of emissions from deforestation in developing countries. • Incentives should encompass the provision of new and additional financial resources, technology transfer, capacity building and enhancement of endogenous capacities. • Financial incentives to be provided by Annex I countries voluntarily engaged.
REDD enabling Fund (cont.)	<ul style="list-style-type: none"> • Means: new and existing national public policies and measures. • Only ex-post results can be considered. • Reductions are to be calculated based on a comparison between the rate of emissions from deforestation for a certain past period with the reference emissions rate • Countries can create a credit or a debit. Credits will be converted to financial incentives coming from developed country partners according to their obligations under the UNFCCC. • Developing countries will then be either: ready for a prompt start; or require capacity building • Scheme based on country's individual definitions for deforestation
Credit for early action	Early action on REDD to be also eligible for crediting
Avoided Deforestation Carbon Fund (ADCF) Note: Many similarities with the REDD Stabilization Fund	<ul style="list-style-type: none"> • Aimed at providing resources for the implementation of specific activities that: a) reduce emissions from deforestation; and/or b) maintain low rates of deforestation. • This fund could be financed through: <ul style="list-style-type: none"> ◦ Voluntary contributions. ◦ An X% levy of Emission Reduction Units or Assigned Amounts Units (similar to the CERs). ◦ A tax on carbon intensive commodities and services in Annex I countries. • Fund replenishment instruments based on the "polluter pays" principle.

Enabling Fund	<ul style="list-style-type: none"> • Aimed at supporting capacity building and piloting activities. • Sources of replenishment should be identified and additional ODA required
Market-based mechanism	<ul style="list-style-type: none"> • Including the CDM and other market mechanisms and coupled with an appropriate demand (e.g. by increasing reduction commitments of Annex I countries).
Preparatory scheme for a post-2012-regime	<ul style="list-style-type: none"> • Assessment of national implementation of policies to combat deforestation. • Activities to improve monitoring and reporting capacity required for REDD • Process to define baselines or reference scenarios including the anticipation of future trends. • Positive incentives including: <ul style="list-style-type: none"> o Voluntary funding. o Similar as during the phase on Activities Implemented Jointly. o Other sources of funding and support.
Financial mechanism for Compensated Conservation	<ul style="list-style-type: none"> • Aimed at compensating countries for maintaining and increasing forests as carbon pools as a result of effective conservation measures and increasing/improving forest cover backed by verifiable monitoring systems. <ul style="list-style-type: none"> o Additionality: Proposal of Compensated Conservation intended to be outside the Kyoto Protocol's CDM, so no need to prove additionality . o Baseline: Increment/decrease to be evaluated as a gain or a loss against a predetermined base year/cut off year (for example 1990). o There is a need for supporting NAI in fulfilling technical and methodological requirements for monitoring and reporting. o Verification: through independent inspections. • Proposes a new financial mechanism linked to verifiable carbon increments through ODA and Global Environment Facility (GEF) funds, or the Climate Change Adaptation Fund be enhanced and made available for such incentives. • Capacity building would be canalized through the UNFCCC. • Fiscal incentives to flow against one single National Project. • Recipient country to decide distribution of incentives amongst participating communities, including investment in further conservation activities in forests or other wooded lands.
Forest Retention Incentive Scheme <i>Note: Established under the UNFCCC and would relate to REDD</i>	<p>Community Forest Retention Trust Accounts</p> <ul style="list-style-type: none"> • Communities that wish to set aside forest areas or manage them on a sustainable basis would seek funding to establish a Community Forest Retention Trust Account (CFRT Account). • Sources of funding for the CFRT Account could include: <ul style="list-style-type: none"> o The Special Climate Change Fund. o Bilateral ODA. o Corporate sponsorship. o NGO contributions. o Government contributions (including through debt-for-nature swaps and similar measures). <p>Forest Retention Certificates</p> <p>Once the CFRT Account is established communities could apply for Forest Retention Certificates. These Certificates would be based on an estimate of the amount of GHG emissions reduced by the project in a period of time. This estimate would be based on current emission trends compared with potential actions to reduce these emission trends.</p> <p>International Forest Retention Fund</p> <p>Funding for the redemption of these Certificates would come from an International Forest Retention Fund (IFRT) established under the UNFCCC; redemption of the Certificates would be granted ex-post. Communities could deposit these redeemed Certificates into their CFRT Account or use the money as the community sees fit. Procedures for assessment and auditing would be kept as simple as possible to minimise transaction costs. The Certificates could only be redeemed by the IFRT. They cannot be sold, transferred or traded.</p>

6. CONCLUSIONS

LULUCF is a complex but highly important issue that will play a vital role of LULUCF in any post 2012 mitigation regime. The current system of including LULUCF activities as climate change mitigation option under the UNFCCC and Kyoto Protocol is not perfect. It is the result of complex negotiations that initially focused on sectors other than LULUCF. Today, with a far better understanding of the problems associated with the accounting, compliance procedures and implementation, it is possible to improve the existing framework under a post-2012 climate agreement.

A range of issues and proposals has been outlined in this paper and non-Annex I Parties will need to carefully consider the implications of integrating the various mitigation options in the LULUCF sector. Some key points may warrant further reflection in preparing positions in respect to LULUCF:

- **While the land use sector, including forestry, is an important source of anthropogenic GHG emissions, it also has great potential for mitigating climate change.** LULUCF activities, including REDD, forest restoration and forest management, can contribute to mitigate climate change through both GHG emission reductions and removals by sinks. Only the LULUCF sector offers these two possibilities for mitigation of climate change—all other sectors can only contribute through emission reductions.
- **Many LULUCF activities have the potential of being an appropriate and cost-effective adaptation measure, reducing overall vulnerability of social systems and ecosystems to climate change.** Forestry, in particular, has an important role to play. Managing in a sustainable manner the 30% of the global land area that is under forest cover will not only contribute to the mitigation of climate change and contribute as an effective adaptation measure, but has many other collateral environmental and socio-economic benefits. This integrative view clarifies why it is so important to consider forestry options and the whole LULUCF sector for mitigation in a consistent way and as part of a wider development concept (see also Blair, T. and the Climate Group, 2008). In this respect, two additional observations are key:
 - **LULUCF mitigation options have to be designed as complementary approaches to mitigation options taken in other sectors.**
- **LULUCF mitigation options need to be based on accurate, while practical, accountability methods.** Currently, more integrative schemes are being introduced in the UNFCCC negotiation that are aimed at facilitating a path for a better integration of LULUCF in the post 2012 mitigation regime (The Terrestrial Carbon Group, 2008).
- **A post 2012 mitigation regime should include the LULUCF sector in a way that the maximum mitigation potential can be used.** This implies the need to agree on general decisions and detailed modalities and procedures that allow undertaking a maximum of activities in all countries while ensuring the environmental integrity of the Convention.
- **All Parties should strive to fully understand the potential role of, and multiple constraints in, LULUCF, and in the forest sector in particular.** This will help ensure that decisions at the international level can be applied at the local level at an affordable cost.
- **The UNFCCC, its Kyoto Protocol and any kind of agreement for a post-2012 regime will have an impact on governing land-use and forests in all parts of the world, particularly in developing countries.** An important consideration for policy makers is the need for effective governance in the forest sector in order to achieve a meaningful role for the sector in mitigating climate change.
- **With increased attention to forests mitigation options, particularly through the ongoing discussion on REDD, it is expected that the countries who clarify forest and carbon tenure aspects and effectively address illegality in forestry and land-use practices are more likely to immediately benefit from future forest mitigation incentives.** Climate change-relevant investment in the forest sector is a long-term undertaking. This requires security with respect to land-use and long-term commitment by involved parties.
- **Parties negotiating under the UNFCCC may need to clarify their own mitigation potential in LULUCF activities, including all possible LULUCF options.** This, coupled with a clear understanding of the potential and weakness of the forest and land-use sector at national and sub-national levels, would build

the basis for their participation in the negotiations.

- **Parties may also need to coordinate their national sectoral policies when defining how to use LULUCF activities as a mitigation option.** LULUCF can have many implications on specific land use planning (e.g. whether forests are available for sustainable forest management; or whether available land is to be used for biofuels or food crops production). A country's priorities should be reflected in sectoral and cross-sectoral policies that allow an appropriate implementation of LULUCF activities.

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Further reading

The report of the *Breaking the Climate Deadlock* initiative was launched in Chiba, Japan, on 20 March 2008 in the framework of the preparation of the G-8 meeting of July 2008. The report aims to build decisive political support among the key players - US, EU, China, India, Japan and Russia - for a framework international agreement on climate change and the strategies for its subsequent implementation that will result in greenhouse gas emissions reductions consistent with those advocated by the scientific consensus. Attached to the report are a number of expert briefing papers, the most relevant for LULUCF are one on 'Sustainable Biofuels' by Richard Heap, Royal Society and the one on Reducing Emissions from Deforestation and Degradation in non-Annex I countries' by Romain Pirard, IDDRI. The main report can be downloaded as pdf document in English, Japanese and Chinese under www.theclimategroup.org/index.php/special_projects/breaking_the_climate_deadlock/.

The Stern report provides valuable background information on the effect of climate change on the world economy. It focuses on three policy elements including carbon pricing, technology policy and energy efficiency and sets a framework for the inclusion of forestry as an effective economic mitigation option. *Stern, N. 2006. Stern review on the economics of climate change. UK Government Economic Service. London, www.sternreview.org.uk.*

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Most of the references presented in the section below provide valuable information on the various issues presented in this report.

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ANNEXES

Annex 1. Key definitions in LULUCF

The Kyoto Protocol establishes which LULUCF activities have to be accounted under Article 3.3, and those additional LULUCF activities that are accounted on a voluntary basis by a Party under Article 3.4. It also lists the fundamental requirements for those activities: they must be human-induced and they must have taken place after 31st December 1989. A clear definition of Article 3.3 and 3.4 activities was adopted at the seventh session of the Conference of the Parties in Marrakech. The adopted decisions, part of the so-called Marrakech Accords, also give a definition of 'forest'. (Decision 11/CP.7 in FCCC/CP/2001/13/add.1). According to Decision 11/CP.7

Forest is a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30% with trees with the potential to reach a minimum height of 2-5 meters at maturity in situ. A forest may consist either of closed forest formations where trees of various story and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30% or tree height of 2-5 meters are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest.

Afforestation is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources.

Reforestation is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.

Deforestation is the direct human-induced conversion of forested land to nonforested land.

Revegetation is a direct human-induced activity to increase carbon stocks on sites through the establishment of vegetation that covers a minimum area of 0.05 hectares and does not meet the definitions of afforestation and reforestation contained here.

Forest management is a system of practices for steward-

ship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner.

Cropland management is the system of practices on land on which agricultural crops are grown and on land that is set aside or temporarily not being used for crop production.

Grazing land management is the system of practices on land used for livestock production aimed at manipulating the amount and type of vegetation and livestock produced.

As stated in the Marrakech Accords, by the end of 2006 each Annex I Party with commitments under the Kyoto Protocol has to choose a national definition of forest and decide which of the additional activities will be elected at the national level. For elected activities a Party has to document how the definitions will be applied to national circumstances and to list the criteria that determine under which activity a land would be assigned in order to minimize or avoid overlapping of land categories.

The area qualifying for each activity may change on the basis of the elected forest definition. For instance, the election of the highest range values may reduce the area eligible for afforestation and reforestation. At the same time, the forest dimensional thresholds will identify the separation between revegetation and afforestation and reforestation in countries that will elect for revegetation. The establishment of a vegetation cover that does not meet the country's definition of forest may be reported under revegetation. Other criteria can influence the area qualifying for a specific activity. Very important here are the concept of *human-induced* and the *precedence conditions and/or hierarchy* among elected activities of Article 3.4.

Deforestation and forest degradation are terms with various definitions. The differences may be the result of the specific goals for which the definition was set (see Annex 2). However, within the framework of the UNFCCC, it is important to keep in mind that definitions should serve the final objective of the Convention, which is *the stabilization of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system*. Further, the Article 2 of the Convention adds that *such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development in a sustainable manner (Text of the UNFCCC)*.

Annex 2. Definitions of deforestation and forest degradation

Forest	
UNFCCC/KP	<p>Forests are defined in the Marrakech Accords as follows:</p> <p>Forest is a minimum area of land of 0.05-1.0ha with tree crown cover (or equivalent stocking level) of more than 10-30% with trees with the potential to reach a minimum height of 2-5 metres at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30% or tree height of 2-5 metres are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest.</p> <p>Note: According to the modalities and procedures for afforestation and reforestation within the CDM, each non-Annex I country had to submit their definition on forest for the first commitment period within the ranges established in the Marrakech Accords (Decision 5/CMP.1).</p>
IPCC	<p>Forest land: This category includes all land with woody vegetation, consistent with thresholds used to define forest land in the national GHG inventory, sub-divided at the national level into managed and unmanaged, and also by ecosystem type as specified in the IPCC Guidelines (since forest management has a particular meaning under the Marrakech Accords, a subdivision of managed forests as described in Chapter 4 of the IPCC Good Practice Guidance for LULUCF may be required). The category also includes systems with vegetation that currently fall below, but are expected to exceed, the threshold of the forest land category.</p> <p>Further, in the Good Practice Guidelines for LULUCF the IPCC uses the definition of forest agreed as part of the Marrakech Accords.</p>
FAO (Forest Resources Assessment – FRA- 2005)	<p>Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10% or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.</p> <p>Explanatory notes:</p> <ol style="list-style-type: none"> 1. Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 meters in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10% and a tree height of 5 meters are included, as are temporarily unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate. 2. Includes areas with bamboo and palms provided that height and canopy cover criteria are met. 3. Includes forest roads, firebreaks and other small open areas, forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest. 4. Includes windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 hectares and width of more than 20 meters 5. Includes plantations primarily used for forestry or protection purposes, such as rubberwood plantations and cork oak stands. 6. Excludes tree stands in agricultural production systems, for example in fruit plantations and agroforestry systems. The term also excludes trees in urban parks and gardens.
ITTO	<p>ITTO defines various related terms:</p> <p>Permanent forest estate (PFE): Land, whether public or private, secured by law and kept under permanent forest cover. This includes land for the production of timber and other forest products, for the protection of soil and water, and for the conservation of biological diversity, as well as land intended to fulfil a combination of these functions.</p> <p>Planted forest: A forest stand that has been established by planting or seeding.</p> <p>Primary forest: Forest which has never been subject to human disturbance, or has been so little affected by hunting, gathering and tree cutting that its natural structure, functions and dynamics have not undergone any changes that exceed the elastic capacity of the ecosystem.</p> <p>Production PFE: That part of the PFE assigned to the production of timber and/or other extractive uses.</p> <p>Protected area: An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources, and managed through legal or other effective means.</p> <p>Protection PFE: That part of the PFE in which the production of timber (or other extractive uses) is prohibited.</p>

Forest Degradation	
UNFCCC/KP	None available yet. <i>However, at the 28th session of SBSTA (June 2008), several parties made submissions with recommendations for consideration in the development of an appropriate definition. Most of these recommendations focused on use or adaptation of the IPCC definition.</i>
IPCC	a) A direct human-induced loss of forest values (particularly carbon). Likely to be characterised by a reduction of the tree crown cover. Routine management from which crown cover will recover within the normal cycle of forest management operation is not included. b) Changes within the forest that negatively affect the structure or function of the stand and site, and thereby lower the capacity to supply products and/or services. c) Direct human-induced activity that leads to a long-term reduction in forest carbon stocks.
FAO	FAO 2000: A reduction of the canopy cover or stocking within the forest through logging, fire, wind felling or other events, provided that the canopy cover stays above 10%. In a more general sense, forest degradation is a long-term reduction of the overall potential supply of benefits from the forest, which includes wood, biodiversity and any other product or service. FRA 2005: Changes within the forest, which negatively affect the structure or function of the stand or site, and thereby lower the capacity to supply products and/or services.
UNEP/CBD/SBSTTA 2001	A degraded forest is a secondary forest that has lost, through human activities, the structure, function, species composition or productivity normally associated with a natural forest type expected on that site.
ITTO	The reduction of the capacity of a forest to produce goods and services. 'Capacity' includes the maintenance of ecosystem structure and functions.
Deforestation	
UNFCCC/KP	Deforestation is the direct human-induced conversion of forested land to non-forested land.
IPCC	Deforestation is the direct human-induced conversion of forested land to non-forested land (considered in IPCC 2003 as in the Marrakech Accords for the Kyoto Protocol).
FAO (FRA 2005)	The conversion of forest to another land use or the long-term reduction of the tree canopy cover below the minimum 10 % threshold. Explanatory notes: 1. Deforestation implies the long-term or permanent loss of forest cover and implies transformation into another land use. Such a loss can only be caused and maintained by a continued human-induced or natural perturbation. 2. Deforestation includes areas of forest converted to agriculture, pasture, water reservoirs and urban areas. 3. The term specifically excludes areas where the trees have been removed as a result of harvesting or logging, and where the forest is expected to regenerate naturally or with the aid of silvicultural measures. Unless logging is followed by the clearing of the remaining logged-over forest for the introduction of alternative land uses, or the maintenance of the clearings through continued disturbance, forests commonly regenerate, although often to a different, secondary condition. In areas of shifting agriculture, forest, forest fallow and agricultural lands appear in a dynamic pattern where deforestation and the return of forest occur frequently in small patches. To simplify reporting of such areas, the net change over a larger area is typically used. 4. Deforestation also includes areas where, for example, the impact of disturbance, overutilization or changing environmental conditions affects the forest to an extent that it cannot sustain a tree cover above the 10 % threshold.

Sources: ITTO, 2005; IPCC, 2003; FAO, 2004; Decision 11/CP.7; FCCC/CP/2001/13/Add.1

Annex 3. Input from the IPCC on LULUCF matters

The main activity of the IPCC is to provide at regular intervals assessment reports of the state of knowledge on climate change. The latest assessment, the Fourth Assessment Report, was completed in 2007.

The IPCC produces also special reports, methodology reports, technical papers and supporting material, often in response to requests from the Conference of the Parties to the UNFCCC or from other environmental Conventions

Besides the information in the four assessment reports, the IPCC has produced other material that focuses on LULUCF matters:

- Special Report on Land Use, Land Use Change and Forestry (2000)
- Technical Paper on Climate Change and Biodiversity (2002)
- Methodology reports.
- Guidelines for National Greenhouse Gas Inventories (2006, 1996, 1994)
- Good Practice Guidance for Land Use, Land-Use Change and Forestry (2003)
- Definitions and Methodological Options to Inventory Emissions from Direct Human-Induced Degradation of Forests and Devegetation of other Vegetation Types (2003).

The IPCC Guidelines include generic methodologies applicable to multiple land-use categories, consistent representation of lands, as well as methodologies for the six land categories emissions from livestock, manure and soil management as well as emissions from lime and urea applications. Finally the guidelines also consider harvested wood products. With the last Guidelines (2006), the IPCC has made an effort in the following:

- Promoting integration between agriculture and land use, land use change and forestry;
- Using managed land as a proxy for identifying anthropogenic emissions by sources and removals by sinks;
- Consolidating previously optional categories, and ensuring consistency with the concept of managed land as a proxy for identifying anthropogenic emissions by sources and removals by sinks;
- Providing detailed guidance for inclusion of harvested wood products in GHG inventories using any of the

approaches that are currently under discussion within the UNFCCC process;

- Including methods to estimate CO₂ emissions due to land use change in wetlands.

Although the IPCC has produced very valuable material regarding LULUCF, the sector remains a complex item for any negotiation. What are then the difficulties in considering LULUCF when mitigating climate change? Even if there is a general agreement on the importance of the sector as “emitter” as well as a “sink” there are some open questions on the ability to devise practical means to include the accounting of sinks in an equitable manner that adequately maintains the environmental integrity of any agreement. Two particular issues are of concern given associated uncertainties: data and the potential non-permanence of removals by sinks.

The previous work from the IPCC is key in considering other issues related to the way emissions and sinks from LULUCF are understood and accounted for in the current arrangements and in future negotiation. The most important of these issues are:

- Should removals of CO₂ from the atmosphere be considered as credits against the debit from an emission?
- Which are the advantages and disadvantages of using a net-net or a gross-net approach and which are the implications of each approach for accounting any reduction commitment in the LULUCF sector?
- Is reducing emissions from LULUCF? as creditworthy as increasing removals?
- How should the emissions from land use (without any land use change) in a future agreement be considered?

Annex 5. From LULUCF to Agriculture, Forestry and Other Land Use (AFOLU)

History within the IPCC deliberations:

- Revised 1996 IPCC Guidelines approach – Land-Use Change and Forestry (LUCF)
 - Identifies major likely land use sources
- 2000 Good Practice Guidance an Uncertainty Management
 - Defines GPG and applies it to Agriculture
- Good Practice Guidance for Land Use, Land-Use Change and Forestry (GPG LULUCF)
 - Expanded Guidance covering all carbon pools
 - Guidance on the representing Land Areas
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories
 - Now (AFOLU)
 - Essentially the same as to GPG LULUCF but integrating Agriculture and LULUCF sectors
 - Extended default values & some improved methods

Changes from LULUCF to AFOLU in a nutshell:

- **Basic methodological approach continued from 1996 IPCC Guidelines, GPG LULUCF to 2006 Guidelines AFOLU:**
 - Stock changes: accounting of emissions and removals
- 1. Inputs (e.g. growth) - outputs (e.g. harvest, decay)
- 2. Total stock at end minus total stock at beginning
- **GPG LULUCF & AFOLU consider all carbon pools**
 - Improved completeness implies both more accurate and reliable results and increased data needs
- **The AFOLU Guidance in the 2006 Guidelines maintains the basic structure, definitions and methods of the GPG LULUCF**
 - Improved guidance in some areas
 - More and improved default data
 - Integration of Agriculture reduces chance of double counting or omissions, some simplification of categories
 - Do not pre-empt accounting choices, all the information needed is retained
 - Mapping between the GPG LULUCF classification and the AFOLU classification is

straightforward.

- Effort and data requirements much the same as for LULUCF

IPCC guidelines in all UN languages can be downloaded under <http://www.ipcc-nggip.iges.or.jp>

Annex 6. Glossary

This section presents the definitions regarding mitigation as given in UNFCCC decisions.

Actual net GHG removals by sinks is the sum of the verifiable changes in carbon stocks in the carbon pools within the project boundary, minus the increase in emissions of the GHGs measured in CO₂ equivalents by the sources that are increased as a result of the implementation of the afforestation or reforestation project activity, while avoiding double counting, within the project boundary, attributable to the afforestation or reforestation project activity under the CDM.

Afforestation is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources.

Baseline net GHG removals by sinks is the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the afforestation or reforestation project activity under the CDM.

Carbon pools are those carbon pools referred to in the Annex to Decision 5/CMP.1 (Modalities and Procedures for A/R CDM) and are: above-ground biomass, below-ground biomass, litter, dead wood and soil organic carbon.

Cropland management is the system of practices on land on which agricultural crops are grown and land that is set aside or temporarily not used for crop production.

Deforestation is the direct human-induced conversion of forested land to non-forested land.

Forest is a minimum area of land of 0.05-1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10-30% with trees with the potential to reach a minimum height of 2-5 metres at maturity in situ. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10-30% or tree height of 2-5 metres are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest.

Forest management is a system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner.

Grazing land management is the system of practices on land used for livestock production aimed at manipulating the amount and type of vegetation and livestock produced.

Leakage is the increase in GHG emissions by sources which occurs outside the boundary of an afforestation or reforestation project activity under the CDM which is measurable and attributable to the afforestation or reforestation project activity.

Long-term CER or "ICER" is a CER issued for an afforestation or reforestation project activity under the CDM which expires at the end of the crediting period of the afforestation or reforestation project activity under the CDM for which it was issued.

Net anthropogenic GHG removals by sinks is the actual net GHG removals by sinks minus the baseline net GHG removals by sinks minus leakage.

Project boundary geographically delineates the afforestation or reforestation CDM project activity under the control of the project participants. The project activity may contain more than one discrete area of land.

Reforestation is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.

Revegetation is a direct human-induced activity to increase carbon stocks on sites through the establishment of vegetation that covers a minimum area of 0.05 ha and does not meet definitions of afforestation and reforestation.

Small-scale afforestation and reforestation project activities under the CDM are those that are expected to result in net anthropogenic GHG removals by sinks of less than 16 kilotonnes of CO₂ per year and are developed or implemented by low-income communities and individuals as determined by the host Party. If a small-scale afforestation or reforestation project activity under the CDM results in net anthropogenic GHG removals by sinks greater than 8 kilotonnes of CO₂ per year, the excess removals will not be eligible for the issuance of temporary CER (tCER) or ICERs.

Temporary CER or "tCER" is a CER issued for an afforestation or reforestation project activity under the CDM which expires at the end of the commitment period following the one during which it was issued.